THE IRON TRADE REVIEW

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THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Finished material continues to furnish the bulk of the activity in the iron trade, though the stress of shortage in raw material lines is still upon every department of the market. Rolling mills could make larger outputs if they could get steel, and steel works in turn are hampered by insufficient pig iron and scrap supply. Heavy melting stock is at a premium and the scarcity here promises to be a factor steel producers must reckon with for months. Meantime pig iron, as more blast furnaces become available, must be used in larger percentages than ever in the manufacture of basic open-hearth steel. The steel corporation suffers with other producers in the failure of railroads to get coke from ovens to furnaces, a number of its furnaces being idle, including four in the Chicago district. Yet pig iron output, which on March 1 was at an estimated weekly rate of 355,333 gross tons, is the greatest ever attained, this representing a yearly rate of nearly 18,500,000 tons. While the foundry iron situation waits there is some activity in steel-making pig iron, with inquiries indicating that a large business is just ahead. In the West more than 75,000 tons of basic is under negotiation in addition to considerable lots at Pittsburg and other Central Western points. A sale of 10,000 tons of Bessemer iron is reported for second half delivery at $20.50 at Valley furnace. The Bessemer pig iron purchases of large interests are still delayed, and this in turn has made a quiet opening market for Lake Superior Bessemer ores, particularly those from Mesabi mines on which the price advance has been considerable. Furnacemen are making coke contracts, however, for the second half, sales of Connellsville coke having been made at $4, while Greensburg district coke has sold for $3.75, these prices being 25 to 50 cents above those for contract coke in the first half of the year. The steel market has shown considerable activity in the past week, particularly in the East. The better demand for sheets and tinplates has brought independent mills into the market again. Very little domestic steel is offered but a round lot of foreign sheet bars is reported to have sold at $29.75 Philadelphia. German basic Bessemer billets are firm in view of reviving demand for steel on the continent, and $28.50, Philadelphia, is commonly quoted. In connection with the better feeling among independent sheet and tinplate producers it is reported that options on a number of Central Western plants have been taken, with a view to consolidation, and that the plans also contemplate the purchase of a Bessemer steel plant which has capacity sufficient to supply such mills as do not now have open-hearth connections. Another consolidation rumor refers to negotiations said to be on foot in the Mahoning Valley, connecting three furnace interests with a steel plant project about to mature. The report comes this week with more indications of authenticity than before that the Clairton Steel Co., with its ore properties, blast furnaces and steel works, and related Valley furnaces, will be taken over shortly by the United States Steel Corporation. The steel rail market is still a center of activity, the purchases for electric lines being particularly large. The rail mills still have unsold capacity in the latter part of the year and the talk of large purchases of foreign rails by the railroads seems not well founded. Foreign mills are also filling up and their prices are far from encouraging importations. On lots less than 500 tons domestic prices have advanced to $30. All finished material lines are strong, but with no indication of further advances. In galvanized sheets recent concessions have been withdrawn.

PITTSBURG.

OFFICE OF *The Iron Trade Review*, 429 PARK BUILDING, March 18.

It is persistently reported that negotiations for the purchase of the Clairton Steel Co. by the United States Steel Corporation have been resumed and that there is every indication that the deal will be consummated. If the properties of this company are purchased a working arrangement will probably be entered into with the Crucible Steel Co. of America, whereby the latter concern will secure its supply of steel from the mills of the steel corporation, as it depends at present for the bulk of its steel supply on the Clairton Steel Co. The purchase of these properties would further increase the strength of the corporation so far as its supply of raw material is concerned. The plant at Clairton, Pa., consists of twelve 50-ton open-hearth furnaces and a blooming mill, and three blast furnaces are under erection which will be in blast by July 1. The first of the three, according to present indications, will be placed in operation about April 1. In addition to these properties, all of the ore holdings of this company, together with those of the Shenango Furnace Co., would be taken over, as well as the three furnaces of the latter company at Sharpsville, Pa. The rumor that the Jones & Laughlin Steel Co is shortly to be taken over continues to circulate, but nothing definite can be secured as to this.

While the steel corporation has been and is strengthening its position, the independent producers are not idle. Options have been secured by a Pittsburg attorney on a number of the independent sheet and tin plate mills in Western Pennsylvania, Ohio, West Virginia and Indiana for the purpose of forming a combination, and it is also probable that some of the smaller independent wire interests will be included. It is stated that an option has been secured on one of the larger independent steel producing interests whose output will be sufficient to supply steel to all the finishing mills not already operating their own open-hearth plants.

During the week the larger independent coke interests have established prices on furnace coke for delivery during the second half of the year. Coke made in the upper and lower Connellsville regions will be sold at $4, while that produced in the Greensburg and Latrobe districts along the main line of the Pennsylvania railroad will be offered at $3.75 per ton. A number of contracts have already been closed at these prices and the indications are that a large tonnage will be closed within the next two weeks. While considerable furnace coke for the first half was sold at prices ranging from $3.25 to $3.50, the bulk of the business was closed at $3.75 to $4, so that the prices for the second half of the year do not represent much of an advance over those of the first half. The delay occasioned in the erection of new ovens has much to do with the establishment of these high prices for second half delivery, and it is expected that the coke output of not only Western Pennsyl-

vania but West Virginia as well will be greatly increased during the latter half of this year.

There has been no heavy buying of Bessemer iron for delivery the second half of the year, but it is believed that something definite will be done before the end of the week with reference to purchases of large interests covering this delivery. Consumers continue to hold off on foundry iron for second half delivery, although the furnaces are not wavering in their prices. Independent sheet and tin plate interests are again making inquiry for sheet and tin bars, both foreign and domestic, as the demand for both sheets and tin plate is very heavy at the present time. Most of the inquiries are for foreign material and as the German market has stiffened considerably there will be little buying abroad. German billets can be laid down in this market under $31.75, and German sheet bars are held at $32.25 to $32.50.

The rail mills have advanced the price on all orders less than 500 tons and more than car lots to $30 per ton. Heretofore this increased price was asked only on orders of 200 tons and under and less than carload lots were held at $32, which price has been continued. There is little doubt that there will be further heavy importations of rails from abroad on all orders for early delivery, but the rail mills believe that they have sufficient capacity to fill all requirements on deliveries running through the second half of the year.

PIG IRON.—We note the sale of 10,000 tons of Bessemer iron for shipment during the second half of the year at $20.50 per ton, which it is believed in some quarters will be the price at which the large orders pending will be closed. While a few concerns are covering their requirements of foundry iron for the second half of the year the large melters are still holding off in anticipation of better prices. The furnaces on the other hand are firm in asking from $21.50 to $22.25, Pittsburg. There has been little doing in forge iron during the week and consumers are not interested in buying for second half delivery. Northern furnaces have very little forge iron for delivery the remainder of the first half and Southern furnaces offer their product at prices ranging from $21.50 to $21.85, Pittsburg, which is considerably higher than Northern furnaces are asking. We make the following quotations:

Bessemer, Valley	$21 50 to 22 00
Bessemer, Pittsburg	22 35 to 22 85
No. 1 Foundry	23 50 to 24 00
No. 2 Foundry	22 50 to 23 00
Gray Forge, Pittsburg	20 75 to 21 00
Chilled Basic, Valley	21 00 to 21 25
Chilled Basic, Pittsburg	21 85 to 22 10

MUCK BAR.—The market continues quiet and consumers still hold off in anticipation of better prices by the Western producers. While Eastern muck bar is still being held at $34 to $34.50, Pittsburg, the Western mills are asking $36 for their product owing to the high price of iron and the cost of puddling and rolling.

STEEL.—Owing to the increased demand for sheets at the present time, independent mills are again in the market for sheet bars and are also making inquiries for round tonnages of foreign bars. The foreign bars could not be laid down in this district under $32.25 per ton, although the domestic price for Bessemer bars is somewhat below this price, but the offerings are very small. There has been no buying of Bessemer billets, which continue to be held nominally at $30.50, Pittsburg. Open-hearth billets are quoted at $31 and upwards, according to the carbon. The demand for rods is strong but the prices are almost prohibitive, Bessemer rods being quoted at $36 to $36.50 and open-hearth at $37. Foreign billets are also firmer and cannot be laid down in this market under $31.50 to $31.75.

FERRO-MANGANESE.—There has been considerable buying of foreign manganese during the past ten days. The buying is limited almost entirely however to English manganese, which is held at $50 in 50-ton lots and over and at $55 in smaller lots.

SPELTER.—The spelter market has stiffened considerably during the week, prime Western grades selling at 5.30c to 5.35c, Pittsburg, in large lots.

SKELP.—There has been some heavy buying of skelp during the week by the largest producer for future delivery. We quote steel skelp at 1.95c to 2c, and iron at 2c to 2.05c.

RAILS AND TRACK MATERIAL.—The rail mills have advanced the price on all orders less than 500 tons to $30, while less than carload lots continue to be quoted at $32. This change in allotment will not affect the large buyers, however. The demand for light rails continues strong and the new mining operations in this district are calling for large tonnages. We revise quotations as follows: Standard sections, 50 pounds and over, in lots of 500 tons and over, $28; car lots and less than 500 tons, $30; less than car lots, $32; light rails, 8 pounds in carload lots, $39; less than carload lots, $40; 12, 16 and 20 pounds, $36; 25 to 40 pounds, $36. Track materials: Spikes, 2.15c to 2.25c; track bolts, square heads, 2.05c; hexagon heads, 2.65c; fish plates, 1.60c on orders accompanying large rail contracts, otherwise 2c to 2.10c is asked.

PLATES.—The plate market continues very strong and premiums of $3 per ton continue to prevail on all orders for prompt shipment. All of the mills in this district are carrying large orders for future delivery and new business is very heavy. On contracts for future shipment the following quotations are made: Tank plates, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.75c; marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive fire-box, not less than 2.10c, and it ranges in price to 3c. Plate more than 100 inches, 5c extra 100 pounds. Plate 3-16 of an inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots, with 5c extra a hundred pounds for less than carload lots. Terms, net cash, in 30 days.

BARS.—Agricultural implement manufacturers continue to specify heavily and from reports received by the mills their trade this spring will be the heaviest on record. As the contracts entered into last March for steel bars by the large implement manufacturers have until July to run their orders for delivery to July, 1904, are not expected in until May or June. We quote as follows: Bessemer steel bars, 1.60c; open-hearth, 1.70c; plow beams and cultivator beams, 1.60c, net; channels, angles, zees and tees, Bessemer under 3 inches, 1.70c; over 3 inches, 1.80c; bar iron, 1.80c to 1.85c, Youngstown, or 1.84¼c to 1.89¼c, Pittsburg, with freight added to point of delivery from Youngstown. Hoops and bands are quoted at 1.90c, full extras, in 250-ton lots and over, and 2c in less than 250-ton lots.

STRUCTURAL MATERIAL.—The strike of the structural workers has tied up much of the work in this district and there is every indication that the strike will continue for some time. An attempt was made to resume work on the Wabash bridge this week with imported workmen, but the members of the union prevented the men from starting at work. Building operations in this district promise to be very heavy this year as a number of large structures will be erected during the summer months and for which contracts will be awarded shortly. Structural material for prompt delivery is much easier to secure at present than for some time, and no more premiums are asked by the mills for prompt shipments. We quote: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles from 3 to 16 inches, 1.60c; universal mill plates, 1.60c.

SHEETS.—The market is very firm and the independent mills would be in a position almost generally to resume operations but for the high price of sheet bars. The tin plate market is also very firm and small premiums are being offered for prompt deliveries. We quote black sheets in 500 bundle lots and over as follows: Nos. 28, 2.75c; No. 27, 2.65c; No. 26, 2.55c; Nos. 22 and 24, 2.45c; Nos. 18 and 20, 2.35c; Nos. 14 and 16, 2.25c; Nos. 10 and 12, 2.10c to 2.15c. Galvanized: No. 16, 2.60c; No. 18, 2.85c; No. 26, 3.35c; No. 27, 3.60c; No. 28, 3.85c; No. 29, 4.35c; No. 30, 4.50c.

WIRE AND WIRE NAILS.—The market continues very strong with good shipments and an increasing spring demand, but there has been no change in prices. We quote: Wire nails, carload lots, to jobbers, f. o. b. cars, Pittsburg,

$2.00; plain wire, carload lots, $1.90; barb wire, carload lots, $2.30; staples, carload lots, $2.20. Galvanizing, 30 cents extra. Carload lots to retailers are held at 5 cents advance in all lines, and on less than carload lots a further advance of 10 cents is charged. Steel cut nails are quoted as follows: Carload lots, $2.10, and less than carload lots, $2.15 f. o. b. Pittsburg, plus freight to point of destination. Iron cut nails are $2.20 in carload lots and $2.25 in less than carload lots. Terms, 60 days, less 2 percent off in 10 days.

PIPES AND TUBES.—Independent manufacturers of pipe are now securing a large amount of business in both light and heavy lines, and while concessions are being made in a number of cases, some of the manufacturers are asking prices slightly above those quoted by the National Tube Co. We revise discounts in carload lots, plus the freight to destination as follows:

MERCHANT PIPE.

	Steel		Wrought Iron	
	Black Percent.	Galv. Percent.	Black Percent.	Galv. Percent.
⅛, ¼ and ⅜ inch	68	58	65	55
½ inch	70	60	67	57
¾ to 6 inch	75	65	72	62
7 to 12 inch	69	59	66	56
Plugged and Reamed				
1 to 4 inch	73	63	70	60
Cut 3 to 6 feet				
⅛, ¼ and ⅜ inch	63	52	60	49
½ inch	65	54	62	51
¾ to 6 inch	71	60	68	57
7 to 12 inch	65	53	61	50
Cut 6 feet and longer				
⅛, ¼ and ⅜ inch	64	53	61	50
½ inch	66	55	63	52
¾ to 6 inch	72	61	69	58
7 to 12 inch	66	54	62	51
Extra Strong Plain End				
⅛ to 8 inch	67	57	63	53

Threads only—Same as Plain End, plus 1¼ percent net.
Threads and Couplings—Same as Plain End, plus 2½ percent net.

Double Extra Strong Plain End				
½ to 8 inch	59	49	55	45

Threads only—Same as Plain End, plus 2 percent net.
Threads and Couplings—Same as Plain End, plus 3 percent net.

NOTE: Orders for less than carload will be charged at 12½ percent advance. Extra and Double Extra Strong Cut Lengths, lower random discounts by 10 percent net for 6 feet and longer, and 15 percent net for 3 to 6 feet.

BOILER TUBES.

Steel.

	Percent
1 to 1½ inches	45
2¼ to 5 inches	62½
1¾ to 2¼ and 6 to 18 inches	52½

Iron.

	Percent.
1 to 1½ inches	36½
2¼ to 5 inches	45½
1¾ to 2¼ and 6 to 18 inches	35½

CASING.

	S. and S. Percent.
2 to 3 inches	58
3½ to 4 inches	60
4½ to 12½ inches	63

MERCHANT STEEL.—Orders for all kinds of crucible steel are very good, the large machine tool builders specifying very heavily at the present time. Shafting is also reported in large demand. We make the following quotations: Turned cold rolled and ground shafting, 47 off in carload lots and 42 percent off in less than carload lots; tire steel, 2.15c to 2.25c; spring steel, 2.25c to 2.35c; toe calk, 2.30c to 2.40c. The following differentials maintain: Less than 2,000 pounds of a size and not less than 1,000 pounds, 10 cents advance; less than 1,000 pounds of a size, 30 cents advance. Tool steel is quoted 7 cents and upwards, according to the grade.

OLD MATERIAL.—There is no let-up in the demand for heavy melting stock, although shipments into this territory have been better during the past week than for some time. Cast scrap is also in good demand by the foundries. Our quotations, gross tons, are as follows: Heavy melting stock, $21 to $21.50; low phosphorus melting stock, $25 to $25.50; steel rails, $21 to $21.25; re-rolling rails, $22.50 to $23; No. 1 cast scrap, $20.50 to $21; borings, $11 to $11.50; busheling scrap, $17.50 to $18.50; old iron rails, $24.50 to $25; turnings, $15 to $15.50.

COKE.—Independent coke producers are now selling their product for second half delivery and sales of furnace coke made in the Connellsville region have been made at $4 a ton. Coke produced in the Greensburg district is being offered at $3.75 for this delivery. No quotations have yet been made on foundry coke for second half delivery, but it is probable that these will range from $5.25 to $6 at the ovens. For the week ending Saturday, March 7, the output of the upper Connellsville region reached 245,720 tons, and that of the lower 50,140 tons.

George S. Griscom, formerly a representative of the Sloss-Sheffield Steel & Iron Co., has been appointed Pittsburg representative of Hickman, Williams & Co., of Louisville, Ky. Offices have been opened at 702 German National Bank Building. This firm handles all grades of Southern iron and makes a specialty of Virginia basic. It has the sale of the iron made by the Virginia Iron, Coal & Coke Co. for Pittsburg territory and all west of Pittsburg, and is exclusive sales-agent for the Red River Furnace Co.

L. F. Huntington, formerly in charge of the Cincinnati office of J. K. Dimmick & Co., has been placed in charge of the Pittsburg office, with headquarters in the Murtland Building. Mr. Huntington succeeds George S. Griscom, resigned.

The Pittsburg offices of Thos. A. Mack & Co., dealers in pig iron, will be removed from their present location in the Empire Building to the new Farmers' Bank Building on April 1.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
519 MONADNOCK BLOCK, March 17.

Buying continues to be limited largely to finished material, for which there is a strong demand. Greater interest has been shown in the pig iron situation in the past week for deliveries in the last half, though as yet few foundrymen are to be found who are willing to place contracts for this period. The market maintains its firmness, notwithstanding the waiting attitude of melters. The coke supply shows little improvement, the Illinois Steel Co. having four furnaces idle for want of fuel. The Iroquois stack, that has been out of blast for some months, will start this week, the company having managed to get a supply of coke by leasing its own cars and shipping in them. The billet and rod mills at Joliet were also started up yesterday, and guarantees have been made the company that will prevent a recurrence of the troubles attending its fuel supply. The inefficiency of railroads in this respect is becoming a very serious question with furnaces and mills in the West. Leasing cars is a costly expedient, taking away about 20 cents a ton from the profits in pig iron or adding that much to the cost to the melter, and therefore is not generally resorted to. Yet the company that adopted this plan was forced to it by the fact that it had over 800 cars of coke lost or tied up at various points between Pittsburg and Chicago, the bulk of which should have been delivered months ago. The quotation on merchant pipe, of 7 to 12 inches inclusive, has been advanced four points, and it is announced that an advance of $3 to $4 a ton will be made this week on galvanized sheets. Orders for sheets have been very liberal, and merchant pipe has also been moving briskly. The volume of new business in iron and steel bars is good, instances reported of concerns placing contracts for deliveries extending into the first half of 1904. Plates have developed a strong tone, and dealers and mills able to give quick deliveries are asking premiums of $2 to $3 a ton. For rails, there is a continued good demand. It is noteworthy that the road asking deliveries on 30,000 to 40,000 tons mentioned last week, will try to place this order abroad, being unable to get the desired shipments from American mills. The scrap market is stronger, light and heavy cast being in good demand.

PIG IRON.—The general tenor of this market is without change. Actual transactions are confined largely to small lots for quick shipment, for which there is a relatively good demand. Foundrymen in greater numbers are sounding sellers as to prices for the last half, but are not disposed at the present time to place contracts. There is no weakness apparent from the selling side, and $18 for No. 2 foundry at Birmingham is the minimum at which Southern furnaces will accept business for this delivery. Some large inquiries have come into the market during the week; one, for 2,000 tons of No. 2 foundry for shipment in the second and third quarter; another for 1,000 tons of charcoal iron for the last half, and

several for smaller amounts. A local selling firm reports that its several offices have inquiries aggregating 75,000 to 100,000 tons of basic iron, and the same quantity of malleable Bessemer, on which it has been asked to figure. There is no improvement in the car situation, and many melters are seriously handicapped owing to their inability to get the iron that has been shipped them. Southern furnaces are also getting backward again in their deliveries as a result of the shortage in rolling stock. The Iroquois Iron Co. starts its No. 2 stack, having accumulated a stock of coke large enough to warrant this step. The fuel scarcity is still very bad, the Illinois Steel Co. having four furnaces out of blast for lack of coke, three at South Chicago and one at Bay View. We quote as follows, the maximum price being asked for deliveries prior to July 1:

Lake Superior Charcoal	$26 50 to 27 50
Local Coke Foundry No. 1	23 50 to 24 50
Local Coke Foundry No. 2	23 00 to 24 00
Local Coke Foundry No. 3	22 50 to 23 50
Local Scotch Foundry No. 1	24 00 to 24 50
Southern Coke No. 1	22 85 to 23 35
Southern Coke No. 2	22 35 to 22 85
Southern Coke No. 3	21 85 to 22 35
Southern Coke No. 4	21 35 to 21 85
Southern No. 1, soft	22 85 to 23 35
Southern No. 2 soft	22 35 to 22 85
Southern Gray Forge	21 35 to 21 85
Southern Silveries (according to silicon)	26 15 to 27 15
Jackson Co. Silveries, 6 to 8 percent silicon	31 30 to 32 30
Ohio Strong Softeners	26 30 to 26 80
Alabama and Georgia Car Wheel	27 35 to 28 35
Malleable Bessemer	23 00 to 24 00
Standard Bessemer	23 30 to 24 30
Basic Iron	22 35 to 22 85

BARS.—The demand for both iron and steel bars is of a healthy nature, and while no large contracts have been placed, the aggregate tonnage is of good proportions. Orders are about evenly divided for deliveries in the second quarter and the last half, one or two concerns having sufficient confidence in the maintenance of present prices to cover for their needs into the first six months of 1904. That stocks in consumers' hands are low is evidenced by the full specifications that are sent in and the demand for quick shipments. Local mills are holding the price of iron firm on the basis of 1.75c Pittsburg, and one local dealer is asking $2 a ton more than this. The movement from warehouse stocks is brisk. We quote as follows, mill shipments, Chicago delivery: Bessemer steel, 1.76½c; angles, less than 3x3, 1.86½c base; hoops, in lots of 250 tons and greater, 2.06½c; less than this amount, 2.16½c; iron, 1.90c. Store prices are as follows: Steel, 2c to 2.10c; iron, 2.15c to 2.20c; hoops, 2.40c to 2.50c; angles, 2.25c rates.

SHEETS.—Consumers are buying liberally both in black and galvanized sheets, and an advance of $3 to $4 a ton is contemplated by local dealers in the latter. We quote mill shipments, carload lots, Chicago delivery: Black sheets, No. 27, 2.91½c; No. 28, 3.01½c. Galvanized, No. 27, 3.61½c; No. 28, 3.81½c. On lots from store, we quote: Black, No. 27, 3c to 3.10c; No. 28, 3.10c to 3.20c. Galvanized, 75 and 5 percent.

STRUCTURAL STEEL.—New business has not been very brisk, being confined to small lots. Specifications are active, consumers sending in full quotas. It is expected that figures will be asked shortly on two large office buildings to be erected in this city. We quote mill prices, Chicago delivery: Beams and channels, 15 inches and under, 1.75c to 2c; 18 inches and over, 1.85c to 2.10c; universal plates, 1.75c to 2.10c; angles, 3x3 and larger, 1.75c to 2c; tees, 3x3 and larger, 1.80c to 1.90c; zees, 1.75c to 1.95c. The maximum quotation is asked by mills and dealers on lots for quick delivery. Material from store, cut to length, is quoted at 2¼c to 2½c per pound.

PLATES.—Plates are very strong, and the inability of consumers to place orders with mills owing to their crowded condition, has turned a large tonnage to dealers. These are asking premiums of $2 to $3 above the base price. We quote mill shipments, Chicago delivery, as follows: Tank steel, 1.75c to 1.90c; flange steel, 1.85c to 2.05c. Prices for lots from stock, Tank steel, ¼ inch and heavier, 2.15c to 2.25c; 3-16, 2.25c to 2.25c; No. 8, 2.30c to 2.40c; No. 10, 2.35c to 2.45c; flange steel, 2.40c to 2.50c.

RAILS AND TRACK SUPPLIES.—There is a good demand for light and heavy rails from electric railroads who are pushing forward plans for the construction of new roads this spring and summer. Mills are rapidly filling up, and we note that the inquiry for 40,000 tons mentioned last week will probably be placed abroad owing to the inability of American manufacturers to guarantee satisfactory deliveries. We quote standard sections, $28; light rails, 45 pounds, $34 to $35; 12 pounds, $40 to $41, with regular differentials for intermediate sizes. Track supplies, mill shipments, are quoted as follows: Angle bars, 2c to 2.10c; spikes, first quality, 2.25c (out of store, carload lots, 2.35c to 2.45c rates); second quality, 2.15c; track bolts, 3½x¾ with square nuts, 2.85c to 3c per 100 pounds; with hexagon nuts, 3.05c to 3.15c, with usual differentials for other sizes.

MERCHANT STEEL.—There is no change in the situation to report. Mills are discriminating in the business they accept, owing to the large tonnage already on their books. Specifications are plentiful. We quote mill shipments, Chicago delivery, as follows: Spring steel, 2.65c to 2.75c; sleigh shoe, 1.95c flat sizes; concave and convex, 2c; out of store, 2.15c; cutter shoe, 2.50c to 2.60c; machinery steel, 2.15c to 2.25c base; plow steel, 2.50c and upwards, according to quality; toe calk, 2.30c to 2.40c; out of stock, 3c to 3.10c; ordinary tool steel, 6c to 7c; specials, 13c and upwards; less than carload lots, 5 to 10 percent higher; cold rolled shafting, carload lots, 47 percent off; less than carload lots, 42 percent off.

MERCHANT PIPE.—Mills report an active demand for all sizes. An advance of four points has been made in pipe 7 to 12 inches, inclusive. Cars are moving more rapidly, and there is less complaint from jobbers on this score. We quote carload lots, mill shipments, random lengths, f. o. b. Chicago, as follows:

	Steel Pipe. Black. Percent.	Steel Pipe. Galv. Percent.	Guaranteed Wrought Iron Pipe. Black. Percent.	Guaranteed Wrought Iron Pipe. Galv. Percent.
¼ to ⅜ in inclusive	66.35	56.35	63.35	53.35
½ inch	68.35	58.35	65.35	55.35
7 to 12 inches, inclusive	67.35	57.35	64.35	54.35

Less than carload lots, 12½ percent advance over above prices.

BOILER TUBES.—Business has been brisk in the past week both from mill and warehouse stocks. We quote below prices on carload lots, mill shipments, f. o. b. Chicago. On less than carload lots from mill, 12½ percent is to be added:

	L. W. Steel Percent.	C. C. Iron Percent.
1 to 1½ in	43.35	38.35
1¾ to 2½ in	55.85	35.85
2¾ to 5 in	60.85	45.85
6 to 13 in	55.85	35.85

For lots direct from warehouse stock:

	L. W. Steel Percent.	C. C. Iron Percent.
1 to 1½ in	40	35
1¾ to 2½ in	50	32½
2¾ to 5 in	57½	42½
6 to 13 in	50	32½

CAST IRON PIPE.—Little new business is coming forward, manufacturers believing that the high price of pipe is largely responsible for this condition. We quote f. o. b. Chicago, 4-inch water pipe, $34; 6-inch, $33; 8-inch and upwards, $32; gas pipe, $1 a ton higher.

BILLETS AND WIRE RODS.—There is nothing of interest to report, the market being very quiet. We quote wire rods (the last sale) $37.50 Chicago; domestic Bessemer billets (the last sale) $30.50; open hearth billets for forging purposes, $36 to $38; for use in rolling mills, $32.50 to $33. German basic Bessemer billets, Chicago delivery, $31 to $31.50. Special carbons are higher. Some domestic Bessemer billets, 4x4 and larger, and being offered from local stocks at 1.90c.

WIRE NAILS AND FENCING.—The billet and rod mills at Joliet were started up again yesterday, after being idle a week. The demand for nails, open fencing and barbed wire has been very heavy, and the leading manufacturer is unable to keep up with its orders. The buying of other products has been of good proportions. We quote prices to jobbers, Chicago deliveries, as follows: Wire nails, carload lots, $2.20; less than carload lots, $2.30. Cut nails, steel, carload lots, $2.26½; less than carload lots, $2.36½. Plain wire, $2.10 carloads, and $2.20 in smaller lots; galvanized plain wire, carloads, $2.40; smaller lots, $2.50. Barbed wire, carloads, $2.50; less than carloads, $2.60; galvanized barbed wire, carloads, $2.80; less than carload lots, $2.90. Staples, carloads, $2.30; smaller lots, $2.40; galvanized, carloads, $2.60; smaller lots, $2.70. Bale ties, 85 percent discount f. o. b. Waukegan on straight carload lots. Poultry netting, 85 and 5 percent discount from list

f. o. b. Joliet or DeKalb, with actual freight allowed not exceeding 50 cents per 100 pounds.

COKE.—The seriousness of the situation may be judged from the statement of one large consumer that it has over 800 carloads en route, the bulk of which should have been delivered months ago. To facilitate the movement of coke, this same concern has leased 400 to 500 cars in which fuel on its contracts is being shipped. Connellsville coke is still very scarce, though a good supply of Southern coke is coming into this market. We quote Connellsville $10 to $10.50, and Southern coke, $9.50 to $10.

OLD MATERIAL.—There is a better demand for old material, and the market is gaining in strength. Light and heavy cast is scarce, and some difficulty experienced in filling all the orders for it. We quote gross tons, as follows:

Old iron rails	$23 50 to 24 00
Old steel rails (mixed lengths)	18 00 to 18 50
Old steel rails (long lengths)	21 50 to 22 00
Relaying rails	31 50 to 32 00
Old wheels	23 00 to 23 50
Heavy melting steel	17 00 to 17 50
Mixed country steel	15 00 to 15 50

The following are selling prices per net ton:

No. 1 R. R. wrought	$19 50 to 20 00
No. 2 R. R. wrought	18 00 to 18 50
Shafting	19 00 to 19 50
Dealers' forge No. 1	16 50 to 17 00
No. 1 busheling and wrought pipe	14 00 to 14 50
No. 1 cast	16 50 to 17 00
Railway malleable	15 50 to 16 00
Country malleable	14 50 to 15 00
Iron axles	23 50 to 24 00
Steel axles	19 50 to 20 00
Cast borings	10 00 to 10 50
Mixed borings, etc	9 50 to 10 00
Wrought turnings	13 50 to 14 00
Machine shop turnings	13 00 to 13 50
Iron axle turnings	14 00 to 14 50
Steel axle turnings	13 50 to 14 00
Stove plate and light cast scrap	12 50 to 13 00
Old iron splice bars	21 00 to 21 50

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, March 18.

Ice in northern harbors has been melting rapidly during the recent warm weather and it is expected that ore will be brought to Ohio ports the first week in April. Except as to weather, however, conditions for opening navigation are not favorable, as the docks hold an unusually large tonnage and at a number of them improvements are not completed. It seems certain that at nearly all the docks dispatch will be very slow for some time after the vessels begin to arrive. Conferences between dock managers and representatives of the longshoremen are being held this week with little prospect of a settlement before April 1. Last year the ore shovelers were paid 13 cents per ton and they now ask an advance of 20 percent. A compromise at 14 cents is talked of, but there are other matters of difference which may delay a settlement. The wages of masters, engineers and other employes have been advanced from 10 to 20 percent and coal will cost 40 cents per ton more than last year. These facts are cited by the vesselmen in support of their claim that considerably higher freight rates should prevail this year, but the inexorable law of supply and demand will rule, and as there is no expectation of a scarcity of vessels, very few vesselmen anticipate that higher season rates than 85 cents from Duluth, 75 cents from Marquette and 70 cents from Escanaba will prevail. There is a disposition to make the differential between Duluth and Escanaba 15 cents this year instead of 20 cents, as it has been heretofore.

IRON ORE.—Sales under the new schedule of prices are not being made very rapidly. Furnacemen are considering the new prices, and, while they are not complaining about the advances, they are placing their orders slowly. This is due in part to the fact that many furnaces have large supplies of ore on hand. Mesabi ores are being disposed of rather more slowly than old range ores, doubtless because of the sharp advance that has come in the former. Bessemer ores on all ranges are being taken up rather more slowly than non-Bessemers. The delay of large consumers of Bessemer iron in making purchases is undoubtedly affecting the ore market.

PIG IRON.—Buyers are still waiting and sellers continue to stand firm without showing the slightest indication of yielding. No large sales are being made, but small orders are rather numerous. Several hundred tons of basic were sold this week for delivery in the third quarter at $20, Valley furnace. Ohio Scotch No. 2 sold at $22.35, Cleveland, for first half delivery. Southern Ohio No. 2 foundry still commands $22 at the furnace, or $23.45 Cleveland, for first half, with no indications as yet of concessions for the second half. The usual Valley price for No. 2 foundry for the second half is $21. We quote as follows, f. o. b. Cleveland, for shipments in the first half of 1903:

Bessemer	$21 85 to 22 35
No. 1 Strong Foundry	23 00 to 23 50
No. 2 Strong Foundry	22 50 to 23 00
No. 3 Foundry	21 75 to 22 25
Scotch No. 1	22 75 to 23 00
Scotch No. 2	22 25 to 22 50
Gray Forge, Valley	20 00 to 20 25
Lake Superior charcoal	26 50 to 27 50

FINISHED MATERIAL.—The recent improvement in the sheet market is reflected in the action of the principal producer in notifying customers that certain concessions heretofore made on galvanized sheets will no longer be granted. It is understood that this change of policy will raise prices from $3 to $5. Definite announcement for the public has not been made and quotations can not be given with certainty, but are about as follows: Galvanized sheets, mill sales, carload lots, Nos. 10 and 11, 2.60c; Nos. 12-14, 2.70c; Nos. 18 to 21, 3c; Nos. 22 to 24, 3.20c; Nos. 25 and 26, 3.55c; No. 27, 3.80c; No. 28, 4.05c; No. 29, 4.45c; No. 30, 4.95c. Galvanized sheets out of stock are quoted 75, 10 and 2½ off. For 3-16-inch black sheets and heavier we quote 2.15c, Cleveland. Mill sales of black sheets to consumers are made on the following basis: No. 24, 2.65c to 2.75c; No. 26, 2.75c to 2.85c; No. 27, 2.85c to 2.95c. The following are prices out of stock: No. 10, 2.35c to 2.50c; No. 12, 2.45c to 2.60c; No. 14, 2.50c to 2.60c; No. 16, 2.55c to 2.70c; Nos. 18-20, 2.75c to 2.90c; Nos. 22-24, 2.85c to 3c; Nos. 25-26, 2.95c to 3.10c; No. 27, 3.05c to 3.20c; No. 28, 3.15c to 3.30c.

The bar iron market is quiet at the prevailing price, 1.80c, Youngstown, but sales at 1.75c, Cleveland, are said to have been made by a local mill. At the same time, one of the large producers is holding to 1.85c, Youngstown, and has made a few sales at that figure under unusual conditions. Steel bars are in good demand at 1.60c for Bessemer and 1.70c for open-hearth, Pittsburg. Some inquiries have come in from agricultural interests. Agreement quotations on structural material are as follows: Beams and channels, 3 to 15 inches, 1.70c; 18 to 24 inches, 1.80c; tees, 1.75c; zees, 1.70c; angles from 3 to 6 inches, 1.70c; universal mill plates, 1.70c. Specifications for structural material are coming in slowly, but the prospect for a strong demand, unless the structural workers' strikes prevent, is excellent. A large tonnage will be used by the city of Cleveland on 12 new school buildings for which bids are being asked.

OLD MATERIAL.—There is a lively demand for scrap, but it is apparently coming largely from dealers to supply demands from Pittsburg, especially for low phosphorus and heavy melting material. Prices are firm and unchanged. We quote as follows, all gross tons:

Old iron rails	$25 00 to 26 00
Old steel rails (over 6 feet)	23 00 to 23 00
Old steel rails (6 feet and under)	20 00 to 20 50
Old car wheels	24 50 to 25 00
No. 1 R. R. wrought scrap	22 00 to 22 50
Mill scrap	19 00 to 19 50
No. 1 machine cast scrap	21 00 to 21 50
Iron axles	29 00 to 30 00
Steel axles	28 00 to 29 00
Axle turnings	18 00 to 19 00
Wrought turnings (free from cast)	16 00 to 17 00
Cast borings	11 00 to 11 50
Uncut wrought iron boilers	12 00 to 13 00
Steel boiler plates	18 00 to 19 00
Grate bars	13 00 to 14 00
Pipes and flues (clean)	17 50 to 18 50
Tank iron	17 00 to 18 00
Hoop and band iron	13 50 to 14 50
Sheet iron	13 00 to 13 00
Wrought drillings	15 50 to 16 50
Malleable iron (railroad)	19 00 to 19 50
Malleable iron (agricultural)	17 50 to 18 00
Stove plate	16 00 to 17 00
Heavy steel	19 00 to 20 00

CINCINNATI.

March 17.

The past week has developed nothing of striking interest in this territory. The coke situation is easing somewhat, with $6 f. o. b. ovens about the inside price for foundry coke. Some of the best cokes are held higher. There is increasing activity in finished material and some strengthening of prices. Pig

iron is still in the waiting situation which has prevailed for some time past and trade very quiet.

PIG IRON.—Prices show no alteration. The little business that has been done, so far as foundry irons is concerned, was at inside prices mainly, but the trade is exceedingly quiet and there were fewer sales this week than at any time since the dullness began. In No. 2 foundry nothing is heard below $18, Birmingham, and sales agents say there is no trouble to sell at this price when a buyer is found who really wants a little iron. There is almost no disposition on the part of the buyers to come into the market for their future needs. Some activity in basic iron is reported and sales aggregating 15,000 tons for delivery in the second half of 1903 are reported. Mill irons remain unchanged. Sales of gray forge are on the basis of $15.50 to $16, Birmingham, but no large lots seem to be offering at these prices; they appear to be just odd lots sold to clear furnace yards. Reports of more active buying in the East have given confidence to sellers in this territory that the improvement in demand would move westward. There is without doubt a deadlock on now between buyer and seller and both are showing good "staying qualities." The buyer is encouraged in his position by the presence of traveling men all over the territory and reports of a rather ragged market in the vicinity of St. Louis. Sellers see no falling off in the consumption of iron and feel that buyers must come into the market before long. In the meantime sales are only for the covering of current needs, but prices are maintained. We quote for quick delivery f. o. b. Cincinnati:

Southern Foundry No. 1	$22 00 to 22 50
Southern Foundry No. 2	21 25 to 21 50
Southern Foundry No. 3	20 75 to 21 25
Southern Foundry No. 4	19 75 to 20 75
Southern Foundry No. 1, soft	22 00 to 22 50
Southern Foundry No. 2, soft	21 25 to 21 75
Gray Forge	18 75 to 19 25
Northern Foundry No. 1	24 15 to 24 65
Northern Foundry No. 2	23 15 to 23 65
Southern car wheel iron	27 75 to 28 75

FINISHED MATERIAL.—The market shows firmness in most descriptions. Demand is steadily increasing and each week's business shows improvement over the preceding one. The only change in prices is a statement that the American Sheet Steel Co. have advanced prices on galvanized sheets to take effect March 16. The amount of the advance has not been made public at this writing, but it is believed to be $3 to $4 per ton. The leading independent mill here advises that it will follow the advance. This increase in prices was not unexpected, as the advance in spelter has increased the cost of manufacture. We quote today black sheets No. 27 at 2.78c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 3.10c; No. 27, 3.20c; No. 16, 2.70c; No. 14, 2.60c; No. 12, 2.50c; No. 10, 2.40c. Galvanized sheets in car lots sell at 75 and 10 and 2½ per cent off; less than car lots 70 and 10 percent off. Tank plates are firm and sell out of store at 2.25c for ¼-inch and 2.35c for 3-16-inch. Beams and channels are quoted at 2¼ to 2¾c from stock, and angles at 2.15c to 2.25c for base sizes.

In merchant pipe a firm tone prevails and the leading interest prices are now the ruling quotations. The independents are believed to be now well sold up and while they have supplied a good part of the demand, current business is now being done on the basis of schedule prices. Merchant pipe and boiler tubes are quoted as follows for carload lots f. o. b. Cincinnati:

MERCHANT PIPE.

(Basing discounts.)

	Steel Pipe. Black. Percent.	Steel Pipe. Galv. Percent.	Guaranteed Wrought Iron Pipe. Black. Percent.	Guaranteed Wrought Iron Pipe. Galv. Percent.
¼, ⅜, ½-inch	66.8	56.8	63.8	53.8
½-inch	68.8	58.8	65.8	55.8
¾ to 6-inch, inclusive	73.8	63.8	70.8	60.8
7 to 12-inch, inclusive	71.8	61.8	68.8	58.8

BOILER TUBES.

	Steel Percent.	Iron Percent.
1 to 1½ in.	43.8 & 5	38.8 & 5
1¼ to 2½ in.	56.3 & 5	36.3 & 5
2¾ to 5 in.	61.3 & 5	46.3 & 5
6 to 13 in.	56.3 & 5	36.3 & 5

OLD MATERIAL.—The market rules steady and unchanged. We quote:

Old No. 1 wrought railroad, net tons	$18 50 to 19 00
Cast machine and foundry, net tons	17 00 to 17 50
Old iron rails, gross tons	22 50 to 23 00
Old steel rails, gross tons	21 50 to 22 00
Old short lengths, gross tons	17 50 to 18 00
Old iron axles, net tons	27 00 to 27 50
Old chilled car wheels, gross tons	22 00 to 22 50
Stove plate, net tons	11 50 to 12 00
Wrought turnings, net tons	15 00 to 15 50
Cast borings, net tons	12 00 to 12 50

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1909, NO. 150 NASSAU ST., March 17.

PIG IRON.—Attention was almost wholly confined to foreign pig iron in this market in the past week. Inquiries for some round lots were made, German irons being asked for in most cases. Actual sales have not been large, and those made were at $20.50 to $21 per ton, New York delivery, duty paid, with the majority of transactions nearer the former than the latter figure. The buying was from founders making provision for the iron they will need until July. Middlesboro No. 3 is now selling at about $18.50, this delivery, with duty paid. There are some negotiations on in foreign irons, which involve some 25,000 tons, mostly German brands, but buyers seem unwilling to close unless concessions are made. This sellers seem unwilling to do, because of the improvement which has taken place in their home market. No actual sales for the second half, either of domestic or foreign makes, are reported beyond one to a Boston concern of a few hundred tons of Southern No. 2 foundry, on the basis of $17.50 at the furnace. The coke situation continues unsatisfactory. We quote; No. 1 X Northern, $23.25 to $24.25; No. 2 X, $22 to $22.75; No. 2 plain, $21 to $21.75; Southern No. 1 foundry, $23 to $23.50; No. 2 foundry, $20 to $22.50; No. 3 foundry, $21.50 to $22; No. 4 foundry, $20.50 to $21.

BILLETS.—The market for German billets is now stronger than it has been for weeks. The demand from all over continental Europe is said to have greatly increased of late. The United States has also contributed to the improving market, and one of the largest importers here states that an agreement as to price is much more easily reached with buyers than as to delivery. Prompt shipments are impossible, importers declare, and a month's time is the best any of them will name. Prices for large lots of Bessemer basic rule from $28.50 to $29, and for open-hearth from $29.50 to $30, New York delivery, duty paid. These are the highest prices we have had occasion to quote in many months, and are subject to cable confirmation.

RAILS.—The buoyancy of the rail market has suffered no abatement, with inquiries from street railways forming one of the most important of recent developments. Discussion of the probabilities of foreign rail purchases this year brings out the general opinion that it will be of insignificant proportions. Foreign makers report their home trade to have improved recently, and the outlook in this direction is very good. Prices reflect these views, as they are much higher than were asked by foreign mills a short time ago. Standard sections continue $28 f. o. b. at mill.

FINISHED IRON AND STEEL.—Small orders were the rule in the structural material market during the past week, and contracts booked by the American Bridge Co. aggregated over 9,000 tons. The company is still having trouble with its men, but the probabilities of an early adjustment of existing difficulties are bright, especially in the Pittsburg district. In sheets buyers are more in evidence than they have been in months, and some good tonnage has been placed. An advance is noted in galvanized. The plate situation is of the best, and the mills have more business than they can satisfactorily handle. In bars, ex-store stocks are being freely purchased at firm prices. New York prices are as follows: Beams and channels, 15 inches and under, 1.75c to 1.90c; angles, 3 to 6 inches, 1.75c to 1.90c; zees, 1.75c to 1.90c; bulb angles, 2.05c to 2.35c; deck beams, 2.05c to 2.25c; sheared steel plates, tank, 2.10c to 2.15c; flange, 2.25c to 2.30c; fire box, 2.30c to 2.50c; refined iron bars, 1.95c to 2.10c; soft steel bars, 1.95c to 2.10c; steel sheets, in carloads, New York, No. 28 black, 3.10c to 3.15c; galvanized, 75 and 5 off.

ST. LOUIS.

March 17.

"If Pittsburg was not so far away on the other side of the railroad world, things might be easier down this way," is the manner in which one agent summed up conditions in this sec-

tion. Although the freight blockade has been partly lifted, there still exists at East St. Louis a congestion that is extremely aggravating to the local interests. This is apparent when it is noted that it takes four and five weeks for a car from Pittsburg to reach St. Louis and usually another week or so to get the car across the river. Stumbling blocks in the way seem to be local blockades at both Columbus and Cincinnati. Birmingham freight takes four weeks en route.

PIG IRON.—The week in review has been quiet and featureless, although there is no weakness in the market. The buying movement which was slightly noticeable last week has entirely died out and consumers are evidently making their last strenuous effort to break the market. From $18 to $18.50 Birmingham for No. 2 foundry for any delivery is still the range and the tendency is rather towards a stiffening in price. Sales have been few and the number of inquiries has also been light. The leading bridge interest has been in the market for 900 tons of No. 4. Up to date the order has not been placed and unless considerable concessions are made nothing may be done now. The coke situation is still disquieting, although the price for spot coke has eased up a trifle during the past week. Coke can be had at East St. Louis for $9.30. There is absolutely no trading for future delivery. This is due to the apprehension of the local interests concerning anticipated labor troubles in Virginia, where most of the coke for local consumption comes from. All foundries are poorly supplied and unless they come into the market for good round lots they will have great difficulty in running. We quote f. o. b. East St. Louis (first half):

No. 1 foundry and soft	$23 75 to 24 25
No. 2 foundry and soft	22 75 to 23 75
No. 3 foundry and soft	22 00 to 22 50
Gray forge	20 00 to 21 00

FINISHED MATERIAL.—Tonnage for all lines of merchant and structural material is enormous. Bars are reported to be especially active and the sale of several round lots is reported. The premium for delivery for structural material runs from $2 to $6 in view of present precarious freight conditions. The market for sheets and plates compares favorably with that of other seasons, although the increase of business cannot be termed as wonderful. No. 27 black are quoted at 3.15c out of store; galvanized, 4.05c. Jobbers report favorable business in angles and channels. For this material 2.50c base is asked.

OLD MATERIAL.—The market continues strong for all grades, with prices unchanged. The volume of business continues large and the foundries are showing considerable disposition to contract for future requirements. The following prices are for gross tons:

Iron rails	$25 80 to 26 00
Heavy melting steel scrap	19 75 to 20 50
Mixed steel	18 50
Heavy relaying rails	31 00 to 33 00
No. 1 railroad wrought	$21 00
Shafting	22 50
Iron axle turnings	16 50
Cast borings	11 50
No. 1 boilers, cut	15 00
Heavy cast scrap	18 00
Stove plate	13 00
Railroad malleable	16 00
Iron axle turnings	16 00
Busheling scrap	17 50

PHILADELPHIA.

March 17.

The chief danger at present is that exactions of labor will check prosperity and possibly result in prolonged strikes. It will probably be several weeks before labor problems assume such shape as to indicate what conditions will be. If labor agitation does not interfere, it is expected that the volume of business the coming summer will exceed that of 1902.

PIG IRON.—The demand for small lots for prompt shipment continues, but no large sales are being made. Stocks on furnace banks are small. Inquiries for foundry are increasing and no one looks for lower prices. There is more interest in forge iron and sales are being made at $20. Basic is quoted at $20.50 to $21. Reports from Europe indicate improved conditions, with prices somewhat stronger. We quote as follows: No. 1 X foundry, $23.50 to $24; No. 2 X foundry, $22 to $22.50; No. 2 plain, $21.50 to $22; Middlesboro No. 3, $21 to $21.50; Scotch, $22.50 to $23.50; basic, $19.75 to $20.50.

BILLETS.—There is a great deal of inquiry for foreign steel and $27.50 to $28 on dock for 1,000-ton lots are inside figures. Smaller lots range from $29 to $31, according to quality. American steel sells at $32 to $33 delivered in buyers' yards. It is reported that 15,000 tons of billets and slabs have been sold to Eastern mills and that 5,000 tons of foreign sheet bars have been sold at about $29.75, Philadelphia.

FINISHED MATERIAL.—There is a strong demand for steel rails and business in nearly all lines is good. The car supply is still rather short and deliveries are delayed. Prices are steady and a shade firmer on bars. Sheets are more in demand with the tendency of prices upward. We quote as follows: Plates in small lots, 2.10c to 2.15c; carload lots, ¼-inch and thicker, 1.97½c to 2c; universals, 2c; flange, 2.10c to 2.20c; firebox, 2.25c to 2.30c; marine, 2.30c to 2.35c. Steel bars, 1.80c to 1.90c; prompt shipments from local mills, Western steel, 1.75c to 1.80c; bar iron, 1.93½c to 1.98½c for carload lots as minimum quantity. Structural material in small sizes is quoted at 1.73½c to 1.80c. Large sizes command all the way from 1.90c to 2.10c.

OLD MATERIAL.—The demand for heavy steel scrap is greater than the supply. The demand for old iron rails is also very strong. Selling prices show little change. We quote as follows: Old steel rails, $21.50 to $22; miscellaneous heavy steel scrap, $21 to $21.50; low phosphorous scrap, $26.50 to $27.50; old steel axles, $27 to $28; old iron axles, $30 to $31; old iron rails, $25 to $26; old car wheels, $24.50 to $25.50; choice scrap R. R. No. 1 wrought, $23 to $24; country scrap, $20.50 to $21.50; machinery cast, $19.50 to $20.50; No. 2 light scrap (forge), $17.50 to $18; No. 2 light scrap (ordinary), $14 to $15; wrought turnings, $16 to $16.50; wrought turnings, choice heavy, $16.75 to $17.25; cast borings, $11 to $11.50; stove plate, $15 to $16.

BIRMINGHAM, ALA.

March 17.

Buying for immediate needs, with some few orders for the last half of the year, about covers the situation as to the Birmingham iron market. There has been a good inquiry the past ten days, and a few good sales have been made for forward deliveries; but the buyers have not as yet evidenced any anxiety to provide for the remainder of the year. At the same time, sellers are making practically no concession, generally holding on a basis of $18.50 for No. 2 foundry, while $18 is minimum. Production continues at maximum figures.

Charcoal iron is in good demand, with but little to be had for 1903 delivery. It is understood the car company was in the market the past week for its supply the last half, but was only able to obtain a portion of the quantity wanted. It is expected that the price for chilling grades will reach $28 f. o. b. Birmingham, as these grades easily bring $26 and $27 now.

The chief item of interest in industrial circles is the report that the American Car & Foundry Co. has acquired the properties of the Southern Car & Foundry Co., recently purchased by the Standard Steel Car interests. The Southern company is capitalized at $3,000,000, half each preferred and common stock. They now operate shops at Anniston, Gadsden, Ala., Memphis and Lenoir, Tenn. They also own a tract of land at Ensley, Ala., on which it has been planned to erect a steel car plant. The acquisition of this company by the American Car & Foundry Co. revives the talk of erecting the steel car plant on this site.

The Metal Market.

NEW YORK.

OFFICE OF *The Iron Trade Review*.
ROOM NO. 1909, 150 NASSAU ST. March 17.

PIG TIN.—At this writing, the market shows a slight falling off from prices previously named. Bullish interests had two very depressing factors to contend with during the week in the heavy shipments from the Straits, and to this country. The London market was the first to take cognizance of these, and prices there receded almost daily, especially yesterday, when a decline of £2 10s in spot, and of £1 15s in futures, took place. Business on the whole continues slow. Closing prices at the Metal Exchange today were as follows: Spot to May,

29⅞c to 30⅛c; April and May, 30⅛c to 30¼c. London closed today, £136 for spot, and £136 5s for futures. Arrivals for the month to date amount to 2,032 tons, with 5,570 tons afloat.

COPPER.—The metal was again strong during the past week, and the highest prices of the upward movement were reached. The trade still continues to look upon the recent advance as calling for the most conservative buying. Actual trades during the past week were extremely limited, and some of the most active brokers did not effect the sale of a pound. It is noteworthy that Wall Street advices which have heretofore been very bullish, now report opinion to be that copper at 13½c was a natural response to trade conditions, but that above that figure artificial causes operated. The London market after advancing to £67, closed weaker today. Closing prices at the Metal Exchange today were as follows: Lake, electrolytic, and casting, 14¾c to 15c; standard, 14c. London closed today as follows: Spot, £65 15s; futures, £65 12s 6d. Exports for the month to date aggregate 4,505 tons, against over 10,000 for the same period a week ago.

LEAD.—The American Smelting & Refining Co. ordered another advance of 30 points during the week, making the price now 4.67½c for carload lots, saying that better trade conditions both here and abroad, especially the latter, warranted such action. St. Louis advanced in sympathy, and is now quoted at 4.57½c. London is slightly higher at £13 15s.

SPELTER.—An exceptionally strong market has prevailed, and prices are higher by 30 points, being 5.50c. St. Louis advanced 25 points, to 5.25c. London is considerably stronger at £23 15s.

ANTIMONY.—A slight decline has taken place in all grades. Cookson's is 8¼c to 8½c; Hallett's, 6¾c to 67⁄8c; and other brands, 6⅝c to 6¾c.

NICKEL.—Large lots can be had at from 40c to 50c, and smaller lots at from 50c to 60c.

QUICKSILVER.—Jobbers only are in the market, and sales have been made on the basis of $48 per flask in lots of 100 flasks. London, £8 15s.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
519 MONADNOCK BLOCK, March 17.

The market continues to gain in strength, buying being of good volume. Copper has again advanced. We quote lake copper, carload lots, 15c; smaller quantities, 15¼c. Pig lead, 4½c in 50-ton lots. Pig tin, 33c. Spelter, 5¼c for carload lots, and 5¾c for lesser quantities. Sheet zinc, 6¼c for lots over 600 pounds. Antimony, 10¾c to 11c for Cookson's, and 9¾c for Hallett's in small quantities. Old metal is in good demand and has advanced in prices. We quote copper wire, $12; heavy copper, $11.50; light copper, $11; red brass, $11; yellow brass, $9.50; light brass, $8; old lead, 3c; zinc, 3c.

A party of Illinois Steel Co. officials have been in Pittsburg this week, inspecting steel plants. On Saturday the plant of the Jones & Laughlin Steel Co. on the South Side was visited, while on Monday and Tuesday the mills of the Cambria Steel Co. at Johnstown, Pa. On Wednesday, March 18, the party went to Sharon, Pa., for the purpose of looking over the properties of the United States Steel Corporation.

At a meeting of the directors of the Canton Structural Steel Car Co. held at Canton, O., this week, the capital stock of the company was increased from $500,000 to $1,000,000. H. A. Cavanah, manager of the Bucher Gibbs Plow Co., was elected president and William Wagner vice president.

The plant of the McKeesport Tin Plate Co., McKeesport, Pa., was set in operation on Monday, March 16, by Catherine Lauck, aged 8 years, the daughter of General Manager J. E. Lauck. Five mills of the plant were placed in operation and it is probable that the remaining five mills will be started within about two weeks. The plant contains ten stands of hot rolls and the same number of cold rolls. The hot mill building is 360x100 feet and the cold rolling and annealing department is 360x75 feet. The tin house contains 19 tinning sets and it and the assorting room are contained in a building 630x60 feet.

PERSONAL.

J. M. Bennington, formerly superintendent of the Warren, O., plant of the American Steel Hoop Co., has resigned to accept the position of superintendent of the puddle and skelp mill of the Youngstown Iron Sheet & Tube Co., of Youngstown, O. He has been succeeded at Warren by Howard Williams, formerly connected with the Mingo Junction, O., plant of the National Steel Co.

John W. Rogers has resigned as secretary of the Youngstown Steel Casting Co., of Youngstown, O. He has been succeeded as secretary by George E. Rose. S. S. Baker has been appointed assistant secretary.

Austin Farrell, of Gladstone, Mich., manager of the Cleveland-Cliffs Iron Co.'s charcoal furnaces, will represent the upper peninsula of Michigan on the Michigan commission for the St. Louis exposition.

Maurice Bell, of Redcar, England, grandson of Sir Lowthian Bell, president of the Bell Brothers, Limited, is in Chicago inspecting blast furnaces and steel works. Mr. Bell is accompanied by G. T. Jones, superintendent of the Clarence works, Middlesboro, one of the plants owned by this corporation, who is reputed to be one of the best authorities on blast furnace practice in England. From Chicago they will go to Pittsburg.

President C. M. Schwab arrived at New York from his European stay on Tuesday. No announcement is made of his plans. Speculation has been active in steel corporation official circles as to the outcome of the approaching annual election, but the meeting itself must be awaited for any reliable information.

Edward L. Leeds, of London, European representative of the Brown Hoisting Machinery Co., Cleveland, who has been in Cleveland and the East for two weeks, sailed Saturday.

C. A. Parker, until recently the secretary of the Louisville Bolt & Iron Co., Louisville, Ky., has sold his stock and retired from the company.

Prof. Chas. R. Van Hise, whose geological work in the Lake Superior mining districts is well known, is prominently mentioned in connection with the presidency of the University of Wisconsin.

A New Blast Furnace at Steubenville.

The LaBelle Iron Works, of Steubenville, O., has decided to erect an additional blast furnace, contracts for which are now being awarded. Stack No. 1, which has been under course of reconstruction during the past year, will be blown in about April 1. It will have a capacity of 400 tons daily. Stack No. 2 will be a duplicate of No. 1 and will be 80x20 feet. It is expected that this furnace will be making iron by the first of next year. At the present time this company has under erection 400 coke ovens whose daily output when completed will be sufficient to supply both stacks with fuel. When the second stack is completed the LaBelle Iron Works will have a sufficient output to supply all its requirements and will make it independent of the pig iron market. Skelp mills for rolling sizes up to 12 inches are now under erection and will be completed within a few months.

The Westinghouse Air Brake Co. will begin at once the erection of a new foundry to be 320 by 65 feet, and constructed of brick with steel frame. It will be located just west of the present air brake works at Wilmerding, Pa. Its erection has been made necessary by the greatly increased demand for castings used in the apparatus manufactured by this company. Owing to the development of the traction brake business, the Air Brake company's present foundry facilities have been overtaxed for some time and in order to insure greater efficiency in production and prompt delivery of material it has become necessary to provide greater capacity. This addition to the plant will materially increase the company's working force, now numbering about 3,000 men, the majority of whom reside in Wilmerding and vicinity.

P. F. Jamaison, of Batavia, O., and A. V. Carroll, of Williamsburg, O., will establish a machine shop at Batavia.

AGREEMENT WITH CHICAGO BRASS WORKERS.

An agreement which will be far reaching in its effect on the relations between manufacturers and workmen in the metal trades was entered into last week between the Chicago Brass Manufacturers' Associations and the Metal Polishers, Buffers, Platers, Brass Molders and Brass Workers' International Union. It reduces the number of working hours from 10 to 9 per day, without any reduction in wages. The agreement is to continue in force one year, expiring March 14, 1904, and during its life the workmen agree that no arbitrary restrictions shall be put upon the output of any factory; that no strikes or lockouts shall occur, and that all disputes shall be settled by arbitration, the decision of the arbitrating board to be final and binding. Other provisions of the agreement are that all overtime shall be paid for at the rate of time and a half, with double time on Sundays and four holidays. The agreement finally reached was the result of a protracted series of conferences, at which the original demands of the workers were materially modified. The employers have secured the removal of restrictions upon output which have been a fruitful source of trouble heretofore.

Other Labor Troubles.

Five hundred sheet metal workers, employed in 27 shops controlled by the Sheet Metal Manufacturers' Association, answered an order to strike a few days ago in Chicago. The primary cause of the strike was the formation of a rival union, which made an agreement with the Sheet Metal Manufacturers' Association for a lower scale of wages than that demanded by the old union.

Drastic measures will be taken by the various shipyard owners in and around New York, as a result of the present labor troubles. Several thousand men have gone out, though only a few have real grievances. A large proportion have struck in sympathy with the men who cannot get their employers to recognize the union to which they belong, and to grant certain other things, among the latter an eight-hour day indoors and a half day Saturday from June 1 to September 30. The employers, who have formed an association, have determined that hereafter they will have nothing to do officially with the labor unions. They will not bar union men, but they will also employ non-union men. They have tired of strikes and labor troubles, they say, and if they are unable to run under the new scheme they will close down their yards.

Over 700 men went out at the Morse Iron Works in South Brooklyn a few days ago without any grievance and without serving notice on their employers.

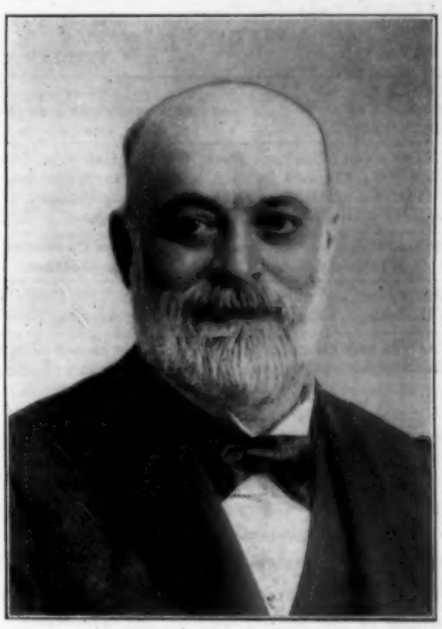
About 2,000 boilermakers are out on a sympathetic strike in Brooklyn.

The American Bridge Co. has made the following statement bearing on the present disagreement with the structural workers' union: "The cost of performing erecting work has increased 200 to 300 percent in the last three years, the wages have increased during that time nearly 100 percent and the efficiency of the men has greatly decreased. In order to accommodate the men the company tried in Philadelphia to hold back only three days' time, but in order to get the rolls in shape, it required the office force to work every night, and it was proved to be impracticable. The unions have been trying to force the employers to employ only union foremen. As the foremen are the employers' representatives, this would place the matter entirely in the hands of the union."

Circulars from the New York unions of iron workers, containing their expected demands for a new agreement as to hours, wages, and conditions of labor, to go into effect May 1, have been received by members of the National Structural Iron Manufacturers' Association. The housesmiths demand $4.50 a day of eight hours' work, an advance of 50 cents. In other cases a uniform demand of 50 cents an hour is made. The unions throughout the country are demanding a new uniform wage scale of 50 cents an hour except in New York. The manufacturers' association, it is said, would be willing to pay a uniform wage scale of 50 cents an hour, but considers that the limit and will resist any demands above 50 cents an hour. Secretary-Treasurer J. W. Johnston, of the International Bridge and Structural Iron Workers' Union in New York, said the union will wait to hear from the employers until a week or two before May 1. Then if no answers have been received committees will wait upon the employers. The demand, he said, will be enforced by strikes if they refuse.

OBITUARY.

Oliver P. Scaife, one of Pittsburg's pioneer manufacturers, died Saturday, March 14, at his home in Allegheny, Pa., aged 66 years. He was first associated with his father and brothers in the manufacture of air and gas tanks and sheet metal specialties, the firm being known as William Scaife & Sons. He later organized the firm of O. P. Scaife & Co., Ltd., tank manufacturers, and was also connected with the Scaife Foundry & Machine Co. Deceased had a prominent part in the development of the street car systems of Pittsburg and Allegheny and was



OLIVER P. SCAIFE.

also the designer of the first steel building erected west of the Alleghany mountains. He is survived by his widow and two sons.

Robert S. Jamison, Sr., president of the Jamison Coal & Coke Co., of Pittsburg, Pa., died Saturday, March 14, at Redlands, Cal., from pneumonia. He was taken down with this disease while on a tour for his health. Deceased was 69 years old and for the past thirty years was interested in the development of the coal and coke industry in the vicinity of Greensburg, Pa. He is survived by his widow and eight sons.

Richard Hoffman, Jr., a partner in the firm of Banning, Cooper & Co., dealers in steel and pig iron, with offices in the Lewis Building, Pittsburg, died at Chicago, on Monday, March 16, from an acute attack of pneumonia. He was 29 years of age. Mr. Hoffman was well known to the iron and steel trade not only of the Pittsburg district but of the entire West, having been connected with the Pittsburg office of Naylor & Co. for many years. Later he was secretary of the Pneumatic Crane Co. Two years ago he became associated with Banning, Cooper & Co., and about six months later he was taken into partnership. The remains have been taken to the home of his parents in New York, where the services will be held on Thursday morning.

Announcement is made by the directors of the John B. Morris Foundry Co., Cincinnati, of the death of their president, John B. Morris, in that city, March 6, 1903. Mr. Morris was born July 16, 1836, and had been prominent in foundry circles in Cincinnati for many years. He established the company of which he was long the head and had been continuously active in the business. His son, George McG. Morris, who has been his associate in recent years, will succeed him in the management of the company.

The factories of the American Window Glass Co. closed last week for the purpose of installing the new machinery. They will be closed from six to eight weeks.

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MARCH 19, 1903

THE FUTURE OF IRON AND STEEL PRODUCTION.

Backed by the apparently germane quotation that "history repeats itself" there has been since 1899 a plethora of iron trade prophets predicting a slump in production and profits, and calamity in general. In the spring of 1901 prophecy took on a more definite form, and foretold a slump in the second half of the same year. Since then there have been semi-annual postponements, and the prophecy of disaster for the first half of 1904 is about due.

All these predictions have been based on the postulate, which the hearer must take for granted, that history in the iron trade has been a succession of brief active periods, followed by much longer periods of comparative idleness. From its continued use one would naturally asume that this view is true, but strangely enough it is distinctly not true, and arguments based on it are in the main fallacious.

It is not necessary to go into tiresome statistics to prove the point. A brief glance at production figures is all that is required. In the 36 years from 1867 to 1902 there were 21 years in each one of which all previous records for the production of pig iron were broken. In only 15 years was it true that any previous year had produced a larger tonnage, and in four of these 15 it was only a single previous year that had done so. In the 34 years of open-hearth steel manufacture only four years failed to break all previous production records, and these four years were all back in the eighties. In 36 years of Bessemer steel manufacture only 9 years failed to break all previous records, and about half of these cases were due to the vagaries in the rail demand. In the past 23 years, for which alone statistics of the country's coal production are available, there were but 5 years in which all previous production records were not broken.

It must be admitted that this is a striking picture, and one that surely has not been before the prophets of distress who oracularly tell us that "history repeats itself." It may be argued, however, that production is not necessarily profit. This may be doubted. It is those who in hard times have not produced that have gone to the wall. In the records of the successful concerns of today, which kept on producing and have survived, we doubt if many years could be found in which fair profits were not made. If then, there are profits for some while others fail, it is a question of the survival of the fittest, of much more moment to the individual than to the iron trade as a whole.

From an examination of several decades of achievement in the iron trade it does not appear that the pace of the past few years has been so rapid and phenomenal as to invite disaster. Take the production of pig iron in 1902, and divide it in half, which gives 8,910,654 tons. This lies between the production of 1891 and that of 1892. Divide again by two, which gives 4,455,326 tons, and this lies between the production of 1881 and 1882. Divide again, giving 2,227,663 tons, and we find the production lies between the production of 1871 and that of 1872, and the process could be carried further, if the records of earlier years could be considered as adding strength to our argument. Some of these previous years were record years while others were not.

So if our production of pig iron doubles in the 10 years from 1902 to 1912 it will do no more than it has done in previous decades. This would require an average increase each year over the previous of 7.2 percent, which would put the 1903 production at 19,100,000 tons. This is just about what would be expected from a consideration of furnaces recently built and being built. In fact, before making a comparison we made a summary of the increased production from furnaces which started during last year and furnaces to be started during the current year, with a moderate allowance for furnaces dropping out which produced last year, and arrived at practically the same total. Further, counting the increased production in 1904 from furnaces to be completed late this year and early next year with a fair allowance for old furnaces going out and entirely new projects coming in, about the same rate of increase is shown, indicating that the iron trade is in reality merely traveling at the pace set in the last 30 years.

LOW TON MILE COST ON THE "BESSEMER" ROAD.

When Mr. Carnegie made his boast that the Bessemer road would haul heavy freight at a cost of three mills per ton per mile there were some who doubted the possibility of any such record. The actual operations, however, have shown much better results than these. It is not to be expected that other railroads should attain the same results; handling a more mixed tonnage, and for more varied distances, they are under a disadvantage as compared with the Bessemer, which is in a class by itself. Still its operations are of interest as showing what can be accomplished in hauling a large volume of low grade freight a uniform distance.

The bulk of the Bessemer railroad freight tonnage is ore for the Edgar Thomson, Duquesne and Carrie blast furnaces of the Carnegie Steel Co. This ore is carried on a 20-year contract, at the rate of 3½ mills per ton per mile. Of the south-bound freight of 5,091,435 tons in 1902 this ore constituted 4,685,045 tons. The northbound tonnage amounted to 1,587,933 tons, showing how large a proportion of the cars went north as empties. This was done because the demand for ore movement during the navigation season did

not allow of cars going to mines to get a return load of coal. Thus, in this respect, the road was not operated in a way to bring out the lowest cost per ton of freight moved. Yet the average cost per ton per mile of all freight moved was 2.22 mills in 1902 and only 1.87 mills in 1901. The difference between 1901 and 1902 is due in part to higher wages and cost of materials in the later year, but mainly to the fact that in 1901 a construction account was maintained, in which was charged a considerable amount of permanent betterment, while in 1902 all expenditures were charged to maintenance of way.

In the very heavy trainloads carried is to be found the chief cause of the low cost per ton per mile. The average trainload south in 1902 was 1,480 tons, and that the limit is about reached for the present is indicated by the fact that this is a decrease of 16 tons from 1901. On account of the large number of empties which went north, the average train load, both ways, was 913 tons, but even this is a record which cannot be touched by any other railroad in the world.

The Bessemer road carried in 1901 3,662,417 tons of ore from Conneaut harbor to the Carnegie furnaces; in 1902 the tonnage was 4,685,045 tons and this year it will be 5,000,000 tons or slightly more. The road now carries all the ore for the Edgar Thomson, Duquesne and Carrie blast furnaces of the Carnegie Steel Co., except special ores of which these furnaces do not require a whole cargo, such ores being taken to the other lower lake docks, connected with railroads reaching other steel corporation plants, and being split up for the various furnaces.

New Billet and Rod Mill at Sydney.

The Dominion Iron & Steel Co., of Sydney, Cape Breton, N. S., has recently purchased a 1,200-ton capacity Morgan 16-inch continuous billet mill for rolling all sizes of billets from 3x3 inches to 1½x1½ inches, with Edwards steam flying shears for cutting to 30-foot lengths. The contract includes a Morgan continuous rod mill, having capacity to roll 200 tons per 24 hours. These will be the first installations of continuous mills in Canada. It is expected that they will be in operation about Sept. 1.

Trade Publications.

Geo. G. Blackwell, Sons & Co., Ltd., of Liverpool, Eng., have sent to the trade a second edition of their pamphlet on "Solid Ingots and Castings in Steel and Iron." It is directed to steel makers, steel founders, machinery founders and chilled iron founders and explains the characteristics of the Blackwell S. A. M. (silicon, aluminum, manganese) alloy and the results secured by its use. The prevention of blow holes, cracks and flaws is attained by a certain addition of the alloy to the molten metal. The elements of the alloy are converted by taking up the oxygen from the casting, into single, double or multiple silicates, borates, etc., which produce a readily fusible slag. This is quickly formed and rises in the form of globules through the liquid and heavier metal of the casting. Only a trace of the constituents of the alloy, estimated at less than one-tenth of 1 percent, remains in the finished casting.

We have already referred to the publications of the Industrial Water Co. and are in receipt of further printed matter in regard to water purification. It includes a neatly printed pamphlet, 4½x6½ inches, containing some 70 pages prepared by C. Herschel Koyl on the work of railroad men on the problem of pure water for steam boilers. The subject is of great importance to many beside railroad interests, and the general principles discussed are something more than mere advertising material. The pamphlet deserves preservation and the vigorous effort to treat a live topic broadly will keep it doing advertising duty where otherwise it would drop into the basket almost useless. The book is being sent out by Henry Beyer, Bakewell Building, Pittsburg.

The 4x6-inch catalogue, "F," of the Sawyer Tool Mfg. Co., of Fitchburg, Mass., contains 48 freely illustrated pages of machinists' fine tools. In addition to the usual range of scales, straight edges, squares (combination and otherwise), there are interesting bevels, surface gauges, limit and other gauges, screw drivers, etc. The firm also manufactures the Prouty valve wheel, which is a combination of coiled wire and hub plate. An engineer will recognize the usefulness of a device having a good grasping surface for wet or greasy hands and which does not warm up like iron and will not split like wood.

Henry Pels & Co., 66-68 Broad St., New York, in a recent leaflet relating to the punching and shearing of structural shapes, reprint a number of letters addressed to them by users of the Werner portable hand power beam shears, the Werner punch and the Johns patent beam shear.

The Bessemer Iron Ore Co., Lancaster, Pa., recently incorporated under the laws of Pennsylvania, was organized to own and operate a deposit of hematite iron ore, situated in the southern portion of Chester County, Pa. The company does not intend to do anything in the manufacturing line, at least for the present. It has what promises to be a large deposit of high grade ore. It will need quite a little machinery to work the mine economically, but cannot say exactly what machinery, as plans are not sufficiently matured.

It is expected that the steel mill the International Harvester Co. is building at 106th St., South Chicago, Ill., will go into operation in April.

The Pere Marquette Railway Co. has placed orders with the American Shipbuilding Co. for two steamers, one to be operated on the Port Huron-Sarnia route and the other, a combination car ferry, will be operated between Conneaut and Port Dover or Port Stanley, on the Canadian shore. The cars will be run aboard the ferry boat and the coal will be dumped into the hold. The new boats will not be launched until 1904.

The Norwalk Steel & Iron Co., Norwalk, O., ran off the first heat of steel at its new plant March 16.

A meeting of the executive committee of the International Association of Blast Furnace Workers and Smelters will shortly be held at Buffalo, N. Y., for the purpose of considering the result of the vote of the lodges on the eight-hour question. The various lodges of the association are now voting on this proposition and upon the result will depend the making of demands for an eight-hour day at the Valley blast furnaces.

It is announced in New York that the proposed consolidation of the ax and edge tool concerns has been indefinitely postponed.

The plant of the Oswego Boiler Works Co., Oswego, N. Y., including the machine and molding shop, has been sold to E. H. Sickels, of Oswego, and B. E. Parkhurst, of New York, for $80,000.

The large addition to the Boston & Albany shops in West Springfield, Mass., will be ready for the machinery in about two weeks and the New York Central Railroad Co. has begun preparation to move the machinists and machinery from the Rensselaer shops so that operations can be started by April 1.

J. W. Ramsey, of Charlestown, Ill., owner of a large foundry, is desirous of locating elsewhere. He is looking for better shipping facilities and expects to double the capacity of his plant.

The contract for 25,000 tons of steel rails for the Intercolonial Railroad in Canada, which has been pending for some time, has been awarded to an English firm.

INDUSTRIAL COMPANIES' REPORTS.

The Sloss-Sheffield Steel & Iron Co. reports for the quarter ended Feb. 28 last (February estimated) the following statement of earnings, with comparisons with the previous year:

	1903.	1902.	Increase.
Profits from oper	$671,614	$279,623	$391,991
Deprect'n extra repairs and ren'wls.	39,002	33,357	5,645
Net earnings	$632,612	$246,266	$386,346
Int. and taxes qr	60,000	60,000	
Balance	$572,612	$186,266	$386,346
Div. prefd. stock	114,000	114,000	
Surplus	$458,612	$ 72,266	$386,346
Prev. act'l surplus	1,199,122	539,730	659,392
Total surp. Feb. 28	$1,657,734	$611,996	$1,045,738

The report of the steel-tired department, spring department and rolling mills of the Railway Steel Spring Co. for the first ten months of the company's existence, shows a surplus of $903,787, which is equal to nearly 7 percent in the preferred stock of $13,500,000.

The statement of the Dominion Iron & Steel Co. for January shows: Earnings of the coal department, $158,845; steel department, $21,020; total, $179,865; fund interest, $33,108; general interest, $8,607; coal interest and lease, $141,433; sinking fund, $4,617! total, $187,765; net deficit, $7,900; preferred stock dividend, $29,166; total deficit, $37,062.

The annual statement of net earnings of the Niles-Bement-Pond Co. and its constituent companies for the year ended Dec. 31, 1902, shows an increase in net earnings of $159,395, which increase, however, was reduced to $109,403 after paying dividends, the difference of $49,992 being due to an increase in dividends of that amount. The surplus, after dividends and depreciation, was $777,465, to which was added $1,382,219 as the enhanced value of investments. This brought the total surplus of the year up to $2,156,684, and, adding the previous surplus, the aggregate amount to $4,413,577—an increase of $2,127,744 over 1901.

The annual report of the Otis Elevator Co. for the year ended Dec. 31, 1902, shows a surplus added to the working capital of $300,000 after the payment of $411,835 in dividends and marking off $266,575 for depreciation. The figures, compared with those of the preceding year, follow:

	1902.	1901.	Increase.
Net earnings	$978,410	$842,096	$136,314
Dividends	411,835	267,539	144,296
Surplus	566,575	574,557	*7,982
Depreciation	266,575	274,557	*7,982
Surplus added to working capital	300,000	300,000	.....

*Decrease.

President W. D. Baldwin says that during the last year the volume of the company's business has very materially increased, thereby justifying the action of the directors in making expenditures during the last three years for increasing and improving the company's plants, all of which expenditures, other than those made for the purchase of real estate and the erection of new buildings, have been charged to operating expenses. The preferred stock has been increased from $4,500,000 to $6,500,000, and about $1,000,000 of this increase remains in the treasury, while 9,895 shares were issued and sold for cash. The proceeds were used in taking up all outstanding notes (except the 4 percent gold notes) and to pay current liabilities.

The annual meeting of the Lackawanna Steel Co. was held at West Seneca, N. Y., March 11. The directors of the company who were elected are: J. G. McCullough, Governor of Vermont; Henry Walters, Baltimore; Warren Delano, Jr., New York; D. C. Blair, New York; John J. Albright, Buffalo; James Spire, New York; H. A. C. Taylor, Newport; H. McK. Twombley, New York; Cornelius Vanderbilt, New York; William E. Dodge, New York; Adrian Iselin, Jr., New York; B. S. Guinness, New York; B. H. Buckingham, Lebanon, Pa.; D. O. Mills, New York; Samuel Mather, Cleveland; Edmund Hayes, Buffalo; Walter Scranton, New York; Moses Taylor, New York; M. T. Pyne, New York; G. R. Fearing, Boston, and Robert B. Van Cortland, New York.

The Graham Nut Co., of Allegheny, Pa., now operating a large nut and bolt plant, has applied for a Pennsylvania charter which will be granted on March 26. The incorporators are Albert Graham, Harry C. Graham and Charles J. Graham.

NEW RAILROAD AND BRIDGE CONSTRUCTION.

The annual railroad construction statistics of the *Railroad Gazette* have been collected and published. These were collected every six months until March, 1902, when it was decided to make an annual publication. The figures for the past year show that in Canada, Mexico and the United States (including Porto Rico, Hawaii and the Philippines) there are 2,058 definite projects, representing, in different stages of advancement, 1,684 companies. Of this number, 1,797 are the projects of 1,490 companies within the United States; 197 representing 142 companies in Canada, and 64 projects by 52 companies in Mexico. The following table gives a comparison of the number of projects and companies in the United States, as recorded in previous statistics:

	United States.	
	Projects.	Companies.
February, 1900	1,350	1,030
July, 1900	1,500	1,090
March, 1901	1,700	1,290
October, 1901	1,689	1,038
March, 1902	1,308	995

The number of lines, extensions, or improvements actually building in Canada and Mexico at the present time is presumably greater than the estimate given, owing to the difficulty experienced in getting information from such distant places. The total number of projects under contract or building is this year larger than has ever before been reported. Several of these roads are practically completed, and are to be put in operation within a few weeks. The following is a comparative estimate of the actual construction work as reported in progress from February, 1899, to the present report:

	United States.	Canada.	Mexico.	Total.
February, 1899	255	22	13	290
March, 1900	295	33	19	347
July, 1900	407	36	22	465
March, 1901	352	35	21	408
October, 1901	352	37	15	404
March, 1902	399	42	12	453
March, 1903	569	38	19	626

In addition to the railroad projects already noted, the same paper gives a very full list of bridges which are under consideration, for which contracts are yet to be let. This list is intended to include the larger steel and stone structures, whether for railroads or not. An idea of the extent of the bridge work on roads under construction is found in the fact that there are more than 900 entries, under about 600 cities and towns of 48 States and territories of the United States and the Canadian Provinces. This list includes between 2,000 and 2,500 new projects. It is interesting to note that there are on the North American Continent more than 70 bridges proposed, the cost of which will reach over $100,000 each, every one of which appears to have a good prospect of being built. There are about 15 structures, the cost of which will reach more than $1,000,000 each. The bulk of these bridges, however, are to be structures costing from $20,000 to perhaps $60,000 each.

New Ruling on Flange Steel Plates

The Association of Steel Manufacturers, at a meeting in Pittsburg, Feb. 6, agreed upon the following ruling: "On and after the 10th inst. no plates will be stamped at a higher tensile strength than the minimum of the order specified. In other words, plates to range in tensile strength from 55,000 to 65,000 pounds will be stamped 55,000 pounds. Plates ranging from 52,000 to 62,000 pounds will be stamped 52,000, etc. Heretofore we have been stamping commercial flange steel 60,000 pounds, with the understanding that the plates ran from 55,000 to 65,000 pounds. If plates are to be stamped 60,000 tensile strength they will have to pull 60,000 pounds. Therefore, if customers wish flange plates to be stamped 60,000 pounds tensile strength, the order should read from 60,000 to 70,000 pounds tensile strength."

The Penn Iron & Coal Co., Cleveland, has completed the rebuilding of its blast furnace at Canal Dover, O., which will be blown in as soon as a supply of coke can be obtained. The capacity will be 450 tons of Bessemer pig per day.

BRITISH STANDARDS FOR STRUCTURAL STEEL.

The Engineering Standards Committee published on March 2 the first fruits of their labors on a list of British standard sections of rolled iron and steel. The committee began work in June, 1901, under appointment by the Institution of Civil Engineers, the Iron and Steel Institute and other engineering societies, and subsequently appointed subcommittees to deal with ships, bridges, railway equipment, etc. Standard specifications for materials will also be prepared and there will be a standard code for tests. The lists of sections just published are preliminary and are for the purpose of allowing the rolling mills to cut any new rolls they may require or recut old rolls to bring them to the new standards. This will be of great value in itself, as Mr. E. Windsor Richards is quoted as saying that at two very large works of which he is director several thousand tons of rolls are constantly in stock and the amount of money invested in rolls for odd shapes in England must be something enormous. The present preliminary list does not contain the weights, areas, moments of inertia, etc., which will be issued at a later date.

The shapes are nine in number, and include equal-sided and unequal-sided angles, bulb plates, bulb angles, bulb tees, channels, zees, H-beams, and tees. In the case of equal-sided angles, there are 16 sections varying from 1 inch by 1 inch to 8 inches by 8 inches; and of unequal angles, there are 30 sections varying from 1¼ inch by 1 inch to 10 inches by 4 inches. For bulb plates there are seven sections, varying from 5 inches to 12 inches. There are six sections of bulb tees varying from 7 inches by 5 inches to 12 inches by 6½ inches. For bulb angles, there are 20 sections varying from 4 inches by 2½ inches to 12 inches by 4 inches. Channels are represented by 27 sections varying from 3 inches by 1½ inches to 15 inches by 4 inches. Zees have eight sections varying from 3 inches by 2½ inches by 3 inches to 10 inches by 3½ inches by 3½ inches. There are 30 sections of H-beams varying from 3 inches by 1½ inches to 24 inches by 7½ inches. The last section on the list is the T-bar, which is represented by 22 examples varying from 1 inch by 1 inch to 7 inches by 3½ inches. With regard to the channels, the thickness of the webs can be increased above the standard, but the width of the flanges will also be increased by the same amount. The lists are issued with all the necessary drawings, and full particulars are given of the profiles, including all radii and thicknesses. The list may be had on application to the secretary, Leslie S. Robertson, 28 Victoria Street, London, S. W., the price being 1s. net.

Cambria Steel Company.

The annual meeting of the Cambria Steel Co. was held at Philadelphia Tuesday, March 17. The officers and directors were re-elected. The report of President Powell Stackhouse for 14 months, from Nov. 1, 1901, to Dec. 31, 1902, shows the net income to have been $5,056,962, out of which were paid three dividends amounting to $2,025,000. A balance to credit of income account amounting to $495,128, made of the total credit to income account $5,516,091. The sum of $800,000 is set aside for the general depreciation fund and $1,500,000 for the betterment and improvement fund. The assets of the company are given as $52,746,213 and the liabilities a like amount. The report states that in addition to $2,145,997 spent upon improvements, $404,274 has been expended for replacements and alterations, and adds: "The unfilled orders on your books are greater than ever before. The increasing cost of raw material, transportation and labor will reduce your profits, as corresponding advances in your leading products cannot now be secured. With this exception there is no reason to believe that there will be in the near future a break in the prosperous conditions now prevailing."

The New Haven Iron & Steel Co., New Haven, Conn., has declared the usual semi-annual dividend of 25 cents per share, payable March 25.

NEW BOOKS.

SIDEROLOGY: THE SCIENCE OF IRON. (The Constitution of Iron Alloys and Slags.) Contains 350 5½x8½ pages with 11 plates and 10 illustrations. Published by the D. Van Nostrand Co., of New York. Price, cloth bound, $5 net.

This is a translation by Charles Salter from the German of Hanns F. V. Jüptner. The original work was the expansion of a series of lectures on "Theories of Hardening," delivered at the Royal Mining Academy at Leoben in 1898-99. The author was impressed with the belief that a compact compilation of such metallurgical data as are scattered through the iron trade journals would be of value to the student, and has set out to make this book a compendium of the chemical research in iron and its alloys, dealing with the properties, the constitution and the methods of working iron and steel. The work comprises three portions, the first of which, after describing the theory of solution, deals with the microscopical and chemical constitution of iron (with its supplementary constituents) and slags. The second part treats of the connection between the chemical composition, the working, the microscopical structure and the other properties of iron and steel. The third part deals with the reaction between the metal, slags and other reagents. The work is deeply technical and of interest to chemists and metallurgists.

LEAD AND ITS COMPOUNDS. By Thomas Lambert. 200 pages, 5½x8½ and 40 illustrations. Published by the D. Van Nostrand Co., of New York. Price, cloth bound, $3.50 net.

The book gives a survey of the progress made in the metallurgy of lead and zinc, the application of electrical science to the cleansing of ores and their after treatment, a description of the pigments of both metals, their manufacture and properties. The scope of the latter portion of the work is made more comprehensive by a discussion of drying oils and siccatives in relation to pigments. A chapter is devoted to the assaying of lead and zinc ores and the testing of paints and oils. The character of a good protection paint for iron and steel is briefly treated in chapter 9, the composition of some coatings being given together with the results of tests made by the Society of Engineers at St. Paul, 1897.

ELEMENTS OF STEAM ENGINEERING. By H. W. Spangler, Arthur M. Greene and S. M. Marshall. Cloth bound, 280 6x9 pages and 273 illustrations. Price, $3. Published by John Wiley & Sons, New York.

This is an elementary work on the subject, contains little theoretical matter and is intended to bring before the student examples of the various forms of steam apparatus, with brief and simple explanations of the construction and use of these parts or machines in steam power plants. The book will be useful to the general reader as well as the student in engineering and manual training schools and institutes. The illustrations are very clear and complete and the volume as a whole is of a conspicuously Wiley degree of excellence.

KINEMATICS OF MACHINES. By R. J. Durley. 387 6x9 pages and 280 illustrations. Published by John Wiley & Sons, New York. Price, cloth bound, $4.

This work, in common with the one preceding, is addressed to first-year students and is based upon the author's lectures at McGill University, Montreal. The treatise is submitted as an introduction to the study of dynamical and other problems in connection with the theory of machines. Problems of velocity and acceleration are treated graphically, a method of determination which is freely employed elsewhere and demonstrates to the beginner the power and adaptability of this means of investigation. The last chapter roughly outlines the various systems suggested for a machine classification, based on purely kinematic considerations, and gives some of the leading points in the history of the kinematics of machines.

The removal of the sheet plant of the Sharon Steel Co. at Sharon, Pa., to Lorain, O., is being considered by officials of the United States Steel Corporation. No definite action has yet been taken, however. It is contended that with these mills operating on heavy sheets the demands of shipbuilding concerns on the lakes for sheets of these gauges could be better met than with the plant at the present location. According to the agreement by which the Sharon mills were taken over mills of a certain capacity are to be retained at Sharon, Pa., and in order to replace this capacity it is reported that the wire and rod mills may be doubled and that the wire nail plant is also to have its output greatly increased.

IRON AND STEEL MANUFACTURE IN MEXICO.

(Special Correspondence.)

DURANGO, Mex., March 10.—For the past quarter of a century, or since Mexico emerged from political turmoil and entered upon an upward career among the nations under the guiding hand of President Diaz, the country has been a liberal customer of the United States and Europe. Iron and steel for her yearly increasing railway mileage, in which the republic of Mexico now leads all the other countries of Central and South America; machinery for her ever-growing mining industry; material and equipment for harbor improvements and drainage works; equipment for the electric lighting of innumerable cities, and for street railway service—all or nearly all of the material elements of the startling transformation in Mexico, in so brief a time, have been contributed from without. And the United States has had by far the largest share of the trade.

These imports have steadily grown in volume until in the year 1901 they reached the sum of $60,525,116. The United States supplied commodities of the value of $32,982,250. Iron and steel and their manufactures naturally form a large part of the imports, as may be inferred from the fact that in the first five months of the current fiscal year machinery and apparatus valued at $4,514,537.06 were brought into the country. Mexico will continue to purchase largely from the United States, for the industries established in this country are few as yet. The iron plants in operation are of limited capacity, being principally foundries, which turn out castings for mines, smelters and haciendas, and machine shops, whose equipment for the most part is neither modern nor extensive.

It is difficult to obtain trustworthy data in relation to the iron and steel manufacturing industries of Mexico. An application to the department of government most likely to be in touch with industry brought a courteous reply to the effect that the information "could not be supplied, not being of record in the archives of the department." The minister, however, gave such information as was within his power, in brief as follows:

"In different parts of the republic there are ores which contain iron. The places in which this ore is the fundamental product, and of which there is knowledge, are in the States of Durango, Jalisco, Hidalgo, and probably it exists in other parts of the Republic, without yet having been exploited."

Much the largest and most important of the iron and steel plants in the north part of Mexico, now in operation, is that of the Mexican National Iron & Steel Co., in the State of Durango, which were built some ten years ago, and within a stone's-throw of what is estimated to be the largest continuous deposit of hematite ore upon the American continent, and one of the most extensive known in the world. This is the Cerro del Mercado, or hill of Mercado, named in honor of its apocryphal discoverer. The works of the Mexican National Iron & Steel Co. have been in operation under different managements, with occasional stops since their erection. They have had a checkered history, and up to a few years ago could not be said to have fulfilled the expectations of their projectors. Incompetent managers and dishonest employes are the most noteworthy features in the early record. The principal owner at present is an Iowa capitalist named Callanan, whose nephew, J. L. Callanan, is the general manager. The other officers are: E. J. Moses, superintendent of the rolling mill; T. F. Witherbee, blast furnace superintendent; J. G. Witherbee, assistant superintendent; and L. Wueste, cashier. The company has been handicapped in various ways. No plan has yet been discovered whereby iron can be made from iron ore alone, no matter how plentiful it may be, or how high it may assay. When it is said that Durango has only one railway system, that freight rates have been abnormally high both upon raw materials and finished products, and that the railway company controls the only available coal supply, the handicaps of these works will be in a measure understood. To these drawbacks must be added that of incompetent labor. Mexican workmen, in the main, are industrious, willing and docile, if not overintelligent. But in the special line of work requisite for making good muck bars, or finished merchant iron, for example, there are no native experts to do the training, and, unfortunately, the importation of experts has not proven wholly successful.

With the exception of two or three foremen, the entire force at the Durango works are native Mexicans. The plant comprises some half a dozen puddle furnaces, a blast furnace, rolling mill, machine shop, and the usual auxiliary buildings. The blast furnace has a daily capacity of 40 tons of pig iron, and the rolling mill can turn out 50 tons of round and flat merchant iron. The company advertises its ability to make castings up to 10,000 kilos. in weight. One specialty is a Chilean mill, which is in good demand in the mining districts. This company is about to enlarge its capacity by building a new blast furnace.

There are indications that the district will have better transportation facilities in the near future. An outlet to the Pacific, less than 200 miles away, would open up what may be regarded as a natural market for the products of this plant, under energetic and competent management—that is, the Pacific Coast country of the United States—but unfortunately the extension of the railway to the Mexican coast is at present a remote contingency.

An excellent grade of charcoal iron is made by the company, and there is a ready market for the output, but at present the plant is run on one shift only, the fires being banked at night. Lack of competent labor is the principal cause of this.

There is also in Durango a small foundry and machine shop, operated by Rowland Ball, whose father, John Ball, an Englishman, and one of the pioneer foreign residents of the city, was associated with one of the first iron-making enterprises in the republic. This plant was situated about six miles from the city and was run by water power. There is also a foundry in the city of Guadalajara, in the State of Jalisco.

These and sundry other plants scattered about the country all occupy places of minor importance in comparison with the modern steel works of large capacity which is now nearing completion in Monterey, in the State of Nuevo Leon. This may be regarded as the first works of primary importance established in Mexico. The company which initiated this enterprise and has carried on the construction to the present nearly complete stage, was organized in 1900, under the title of La Compania Fundidora de Fierro y Acero de Monterey, with a capital of $10,000,000, Mexican silver. This capital is nearly all paid up. The principal stockholders are United States and Mexican capitalists, prominent among them being Eugene Kelly, of New York, and Senor Vincente Ferrara, of Monterey. The latter is the president of the company. Some details of this plant have already appeared in *The Iron Trade Review*. It has been built under the supervision of William White, Jr., of Pittsburg, and is in all respects a modern plant, no money having been spared in its construction or equipment. The buildings were erected by the American Bridge Co. The blast furnace house is 200x50 feet; blast furnace cast house, 180x50 feet; blast furnace blowing engine house, 130x50 feet; blast furnace boiler house, 135x50 feet; open-hearth building, 204x100 feet; mill building, 1284x100 feet; mill boiler building, 200x50 feet; rail finishing building, 196x50 feet; foundry, 225x120 feet; power plant, 156x56 feet; forge building, 100x50 feet; storehouse building, 60x60 feet; oil house, 60x30 feet; laboratory, 35x45 feet. All the latest labor-saving and patented devices applicable to iron and steel manufacture are embraced in the equipment of the various departments. The yearly capacity is given as 128,000 tons as follows: Rails, 40,000 tons; beams and shapes, 40,000 tons; billets and bars, 10,000 tons; pig iron, 30,000 tons; castings, 8,000 tons.

The blast furnace and some of the shops are already in operation. Workmen said to be experienced in this line of labor have been imported from nearly all the countries

of Europe. The stockholders entertain great expectations of this plant. Some enthusiasts believe that the imports of steel rails and such other products as the works can turn out will be checked, even if they do not cease altogether. The directorate is composed almost entirely of Mexicans. Few if any of its members have had any experience in the business. People who know from dearly-bought experience the difficulties attending the translation of iron and steel making, which naturally belongs to a Northern latitude, to a tropical environment, are not slow to predict a catalogue of troubles for the company and a general reorganization before the bed-rock of competitive business with foreign makers is reached. One thing is certain—there is a great home market awaiting the products of this plant. It ought to prove a profitable undertaking, and doubtless will in time, but a good many problems will have to be solved.

Of works projected, only one of an ambitious character is reported. This also is a steel plant, whose proposed point of location is the town of Tepeyahualco, in the State of Puebla. According to the terms of a concession recently granted to Senor Emilio Segura, the plant is to be a complete one for the manufacture of "rails, beams, columns, etc." Construction must be commenced within a year from January 30, and the works completed within three years. One hundred thousand dollars must be expended within six months. As a guarantee the concessionaire has deposited $5,000 in bonds in the National Bank of Mexico. It is not known as yet who the capitalists are for whom Senor Segura is acting, but that business is meant is evident from the fact that the granting of this concession was opposed in the Department of Fomento by the legal representative of the Compania Fundidora de Fierro y Acero of Monterey.

Summing up the situation, it may be said that iron and steel making in Mexico is an infant industry. A beginning has been made which promises well. All the raw materials are at hand in profusion. Labor of the right kind—and, perhaps, grit—are alone lacking. Under the most favorable circumstances, years must elapse before the home demand for manufactured iron products will be filled from native sources. Upon the success or failure of the works at Monterey much depends. The opening up of new coal fields and the construction of new railways will not only greatly accelerate the growth of the industry, but are indispensable to that end. Such growth will be slow for years to come. The evolution of the iron-making business here will be retarded by a greater number of setbacks than have attended the development of the same line of industry in almost any of the countries wherein it has achieved a position of the first rank.

JOHN JAMES DAVIS.

The Baltimore Railway Specialty Co., Baltimore, recently incorporated, will manufacture ball bearing center and side plates, devised to supply frictionless bearings for railroad cars. The device was invented by J. E. Norwood and the company informs us that valuable improvements have been added and that fifty railroads are now making tests of the bearings. Mr. Norwood organized the Baltimore Ball Bearing Co. to manufacture his invention. This company has been absorbed by the Baltimore Railway Specialty Co., which has much larger resources. Thomas H. Symington is president of the new company, J. W. Middendorf vice president, W. Eason Williams secretary and treasurer, and Mr. Norwood is mechanical engineer. These officials, with J. W. Woodland, will compose the board of directors. The capital stock of $900,000 is divided into $750,000 of common stock and $150,000 of preferred stock.

It has been decided to let the contract for the construction of the entire superstructure of the Manhattan Bridge, New York, at one time, instead of letting the contracts separately. It is predicted that this plan will permit the construction of the bridge to be made a year sooner than it would if different contractors were to work upon it. Bids will be asked by June 1st.

NEW PLANT FOR THE MANUFACTURE OF PRESSES.

The Fred J. Swaine Co., of St. Louis, manufacturer of presses, dies and sheet metal goods, has occupied for several weeks a new plant located within a few squares of the business district of St. Louis, convenient to railroads and to supply houses. Pressed brick and slow combustion material were employed throughout. The second story at present covers only a portion of the ground space, but foundation and walls have been so constructed that the second story can be extended the entire length of the building when necessary. The entire ground floor is set in concrete with 2-inch tongue and grooved flooring, except the part under the offices which is used as a boiler room and workmen's lavatory and has a granitoid flooring. The building is heated throughout with steam, coils and radiators being placed at close intervals, insuring a comfortable temperature in the severest weather. The lavatory is equipped with individual lockers, stationary washstands, with hot and cold water, gymnasium and other conveniences.

The ground floor contains 18,000 square feet of space and is arranged in different departments, namely, round die department, irregular die department, press department, erecting floor and blacksmith shop. All these departments have been provided with new and modern appliances for the rapid handling and production of work. The round die department is equipped to produce dies for sheet metal shapes used in the manufacture of cans, buckets, kegs, electrical goods, stove work, etc. In this department are a number of special tools and lathes. The irregular die department produces dies for flat and irregular pieces made from bar and sheet metal. The tools include slotters, routers, shapers, vertical and horizontal millers, small lathes, drills, etc. A great number of tools are brought into use on even the smallest piece of material and the workmen require to be highly skilled.

The press construction department calls for a large range of machine tools, varying from the smallest drill to the large planers and boring mills. These tools are constantly in use as the works produce machines ranging from beaders and trimmers of 50 pounds to heavy double crank-geared presses weighing 30,000 pounds.

Leading to the erecting floor, where the various machines are assembled, the crane service consists of jib and traveling cranes, covering the entire length of the building. In the assembling of special machines, all parts being machined exactly after drawings, the use of hammers, chisels and files is almost dispensed with. Where formerly an apprentice was first taught the use of these tools he now finds himself a full-fledged mechanic without them.

The blacksmith shop, which is run independent of the works, contains power hammers, shears, forges, furnaces, etc., to produce forgings which are used principally in die construction and form no small part thereof. To one side of this shop is arranged the hardening shop, which takes up small space, yet is of great importance. Carelessness in this work entails considerable loss as the pieces to be hardened are of different shapes, some of a few ounces weight, while blanking dies run into the hundred pounds, and each piece has to be handled in its own way. The woodworking department, pattern shop and storage room take up the entire second floor. They are equipped with band and bench saws, wood lathes, trimmers and other woodworking machinery. Wide galleries make every pattern accessible without loss of time. The entire equipment is operated by a series of motors, some of which are direct connected.

Referring again to the fire in the cinder bank under its galvanizing shop at Martin's Ferry, O., the Laughlin Nail Co. writes that the fire has been extinguished and the works were put in partial operation last week. All departments are expected to be working to full capacity by March 23. Though the fire has caused considerable expense, as well as loss of time, no department was at any time in danger.

The board of trustees of the Ohio State University have awarded the contract for a new building for the department of engineering to be erected at a cost of $73,883.

LAKE SUPERIOR IRON MINES.

The complication over the Negaunee mine, which has made the question of lease ownership one of uncertainty for some time, was settled out of court at Marquette, Mich., last week. The case was entitled, "Margaretha Lonstorf vs. Angeline Maas et al., a suit for the partitioning of the ownership of the fee." The Lonstorf and Maas interests were each one-third of the whole. The litigation grew out of the refusal of the American Mining Co., the holder of but 7-108s of the fee, a subsidiary company of the Oliver Iron Mining Co., to acquiesce in a lease which all the other fee owners had agreed to give to the Cleveland-Cliffs Iron Co. The Oliver company has been and is now operating the mine. Recently when the fee owners were making a new deal, to go into effect on the expiration of the former lease, the Cleveland-Cliffs people made the best bid. The settlement last week was due to the American Mining Co. finally acquiescing in the action of the other fee-owners.

The big pumping plant of the Penobscot mine, Mesabi range, has been taken out. It is understood that the plant will be removed to one of the United States Steel Corporation's wet mines on the Menominee range, and that the Penobscot will be allowed to fill with water. The Penobscot is the wettest mine on the range and the cost of pumping has been enormous. There is a large body of ore at the mine, the main shaft having a depth of nearly 300 feet, 230 of which penetrates the ore body. Shipment of ore was first made in 1897, and the total output has been 704,456 tons, of which 430,611 tons was shipped in the past two years. Near the mine, the ground, apparently for acres, is strewn with pumps, boilers, pipe, fittings, and all the appurtenances of a great iron shop. Now that this outfit is all out of the ground it seems astonishing how it was all got down, not to mention its use underground. The Steel Corporation ought not to have to buy any pumps for some time to come.

Recent discoveries of iron ore on what has been named the Cheshire district, extending from the southern part of Marquette county, Michigan, to Delta, Mich., have convinced the explorers that the new field will be an important producer. Diamond drill borings have shown ore deposits having a thickness of 70 feet, this being at almost right angles to the dip of the formation, and mining men are of the opinion that the main basin of concentrated ores lies at greater depth and purer deposits are to be found. Assays show ores having 62 percent metallic iron and but .028 percent phosphorus. The only producing mine on the new range as yet is the Princeton, operated by Tod, Stambaugh & Co., of Cleveland.

Neither the Duluth & Iron Range nor the Duluth, Mesabi & Northern road expects to handle much more ore this year than last. There will be a number of new shippers that will increase the amount to be moved and a few old mines will be idle. Among these latter are the Penobscot, Hale, Roberts, and some others. The new properties for the most part will ship via the Great Northern road, for they are operated by independent concerns who were able to make bargains with that road, and secure concessions as to lands, etc., in return for traffic. The other roads had no ore bearing lands to give out to others for mining purposes. The Great Northern will increase its shipments materially over last year, but not in so large a proportion as then, and several mines that have shipped over that road may change to other lines. Railroad men do not look for any considerable ore movement before April 10 to 15.

Pickands, Mather & Co. have commenced work on a shaft house and surface improvements at the new Elizabeth, bought by them for the Lackawanna Steel Co. for $350,000. They will sink a shaft and may get out a small amount of ore this year. Elizabeth ore is of fairly good grade and there are some 10,000,000 tons of it. The mine will be wet, especially now that Penobscot is idle and filling with water. It lies just southeast from Penobscot, on the same formation.

The Cypress property, in section 10 T57 R21, is soon to be made a mine by Jos. Sellwood and Pickands, Mather & Co., who have the lease jointly. Stripping contractors will commence work there in a short time and will rush their job to the limit.

Wallace, Roberts and others will open a small bunch of ore in section 19 T58 R18, near the Grant where Mr. Roberts was mining last year for the Interstate Mining Co.

At the new Albany, belonging to Pickands, Mather & Co., they are busy sinking a shaft and will mine heavily this year. The mine is noted as having the deepest ore body known on the Mesabi range, one drill having penetrated ore for more than 400 feet. The mine is in section 32 T58 R20, and covers 80 acres. It is a large property and a very valuable one. It belonged to A. Maitland, of the Republic Iron & Steel Co., who sold to Pickands, Mather & Co., for $200,000.

The Lake Superior iron country is all agog over the marvelous finds of copper in the Warren district of Arizona, in which they are very largely interested, and which were developed by T. F. Cole, of the United States Steel Corporation and associates. The word "marvelous" is used in this connection advisedly. Calumet & Arizona, the first of these properties, is now evidently second to no copper mine in America as to richness of ores or value of deposit and others seem to be following close to it. Immense fortunes will be made by lake iron and copper men in that district. In Calumet & Arizona there are now opened thousands of tons of ore running up to 60, 70 and 80 percent copper, and there are more than 1,000,000 tons blocked out averaging better than 10 percent. This is the work of three years.

Stockpiles at old range mines are now larger than they have ever been at this season, so far as new ore is concerned. There was very little left on stock docks last fall, and practically all the accumulation now is of this season. It is not at all certain, however, that all this ore will be got down this year, and it is probably not so expected.

In Sauk county, Wis., near Baraboo, several diamond drills have been working two years or more, under the supervision of W. G. LaRue, of Duluth. Mr. LaRue secured the financial assistance of R. Whiteside, also of Duluth, and they have developed a very promising field. They have optioned some of their properties to the Deering Harvester Co., some to the Illinois Steel Co., and others, and all these parties are now actively at work, in addition to those who have been attracted by the success of preliminary work by these first explorers. Ore had been known there for many years but it had not been considered valuable until Mr. LaRue, who had been a practical iron man from Minnesota, made his examinations. Paint rock had been mined there some time previously. The Deering company and the Illinois Steel Co. are sinking shafts and preparing for mining the coming season. The ore is of good grade and seems to be in abundance, though not enough work has been done to prove the region. Baraboo is in the south central part of Wisconsin, only about 150 miles northwest from Chicago. There is a great activity just now in this district, and many are starting to explore.

No less than 18 new mines are being developed into shippers for 1903 on the Mesabi range alone, with 17 more that shipped slightly last year and are now prepared to extend their output materially, and probably intend to do so. To offset this some of the older producers of the range will curtail their outputs, or there would be a tonnage from the Mesabi this year that would be unwieldy. Some of these new mines will be shippers to a considerable extent; others will do little, and some of them will be unable to get ore on the market till near the close of the season. Three of them are United States Steel Corporation mines, but the rest belong either to independent steel makers or to sellers of ore in the open market. Several belong to interests allied with the new Lackawanna Steel Co., several to Jones & Laughlins, others to the Republic Iron & Steel Co., quite a group to Drake, Bartow & Co. and Jos. Sellwood, and to Corrigan, McKinney & Co.

The American Window Glass Machine Co., incorporated in New Jersey recently, with a capital stock of $20,000,000, divided into $7,000,000 7 percent cumulative preferred stock and $13,000,000 common stock, is an adjunct of the American Window Glass Co. It is the purpose of the company to install glass blowing machines, which, it is said, have passed the experimental stage, many of them having been operated successfully in plants of the American Window Glass Co. for some time.

IMPORTANT CHANGES IN PATENT LAWS.

The Fifty-seventh Congress passed a patent law amendment act which received the approval of the President on March 3. The amendments follow the provisions of the international convention for the protection of industrial property and the extension of time and other advantages will give to inventors here and abroad uniform conditions in regard to patent applications and ownership. Section 4887 is amended by changing the word "seven" to "twelve," so that the enactment, stripped of purely legal verbiage, will allow an inventor to receive a patent unless the application for a foreign patent has been filed more than twelve months prior to the filing of the application in this country. The co-operative character of the new law may be illustrated by the following quotation from the amended statutes:

"An application for patent for an invention or discovery or for a design filed in this country by any person who has previously regularly filed an application for a patent for the same invention, discovery, or design in a foreign country which, by treaty, convention, or law, affords similar privileges to citizens of the United States shall have the same force and effect as the same application would have if filed in this country on the date on which the application for patent for the same invention, discovery, or design was first filed in such foreign country, provided the application in this country is filed within twelve months in cases within the provisions of section 4886 of the Revised Statutes, and within four months in cases of designs, from the earliest date on which any such foreign application was filed. But no patent shall be granted on an application for patent for an invention or discovery or a design which had been patented or described in a printed publication in this or any foreign country more than two years before the date of the actual filing of the application in this country, or which had been in public use or on sale in this country for more than two years prior to such filing."

The oath testifying to the inventor's belief in the originality of the device was formerly to be taken before any minister, charge d'affaires, consul, commercial agent holding a commission under the Government of the United States, or notary public, but this requirement has been given greater elasticity by the addition of any "judge, or magistrate having an official seal and authorized to administer oaths in the foreign country in which the applicant may be, whose authority shall be proved by certificate of a diplomatic or consular officer of the United States."

The section in regard to the rights of executors to carry into effect the work of an inventor is given international force by the addition to the statutes of the following:

"The executor or administrator duly authorized under the law of any foreign country to administer upon the estate of the deceased inventor shall, in case the said inventor was not domiciled in the United States at the time of his death, have the right to apply for and obtain the patent. The authority of such foreign executor or administrator shall be proved by certificate of a diplomatic or consular officer of the United States."

Lastly, the law relative to caveats which commenced with the words "Any citizen of the United States" is radically changed to read "Any person," and the latter part of the section is also trimmed to correspond, so that the law now reads as follows:

"Any person who makes any new invention or discovery and desires further time to mature the same may, on payment of the fees required by law, file in the Patent Office a caveat setting forth the design thereof and of its distinguishing characteristics and praying protection of his right until he shall have matured his invention. Such caveat shall be filed in the confidential archives of the office and preserved in secrecy, and shall be operative for the term of one year from the filing thereof; and if application is made within the year by any other person for a patent with which such caveat would in any manner interfere, the commissioner shall deposit the description, specification, drawings, and model of such application in like manner in the confidential archives of the office and give notice thereof by mail to the person by whom the caveat was filed. If such person desires to avail himself of his caveat he shall file his description, specifications, drawings, and model within three months from the time of placing the notice in the post-office in Washington, with the usual time required for transmitting it to the caveator added thereto, which time shall be indorsed on the notice."

CARBIDE OF SILICON IN STEEL WORKS AND FOUNDRIES.

The use of carbide of silicon in connection with the manufacture of steel has increased extensively in the past few years. It has been employed to some extent as a substitute for ferro-silicon. Manufacturers of steel castings were first to appreciate its value, particularly in basic open-hearth work. Much of such work, to insure solid castings, calls for a higher silicon content than can be secured from pig iron that comes within basic requirements. If the addition of ferro-silicon is made to the ladle cold too great chilling results, and it has been customary to melt it first in a separate cupola. In certain cases it has been the practice to add directly to the furnace, but this is accompanied by excessive loss of silicon by reason of its rapid action on the basic slag and to some extent on the basic lining of the furnace.

Carbide of silicon containing 62 percent of available silicon is added directly to the ladle during the process of tapping and without previous heating. Uniform action is secured and complete solution generally takes place by the time the ladle is full. The carbide has also found large use in steel for various purposes that is first run into ingots, and in which the silicon is very much lower than in steel castings, amounting generally to but a trace. Manufacturers of tool steel have found that the freedom of carbide of silicon from phosphorus and sulphur offers great advantages, and it is therefore used in considerable quantities in the open-hearth practice of such manufacturers and to some extent in crucibles. Operators of the acid open-hearth process have used carbide of silicon in cleaning dirty furnace bottoms. When the hearth becomes crusted over a small quantity of carbide of silicon is sprinkled over it and on being heated sets up such a scouring action as to reduce the residue to fluid slag which is readily removed from the hearth.

In general foundry practice there has been little substitution thus far of carbide of silicon for high silicon iron, though as a means of reducing iron oxides in burnt iron and in fact all scrap, carbide of silicon is much the more effective. In ordinary cupola practice there has not been realized such advantage from the employment of carbide of silicon as might be expected considering its high silicon content. That steel foundries have had no difficulty is due to the much higher temperatures employed than in gray iron foundries, the addition of carbide of silicon being readily soluble in the ladle containing the molten steel.

Hard soldering has been made of such service in many shops—through its use in the manufacture and repair of bicycles and automobiles, as well as the saw brazing in pattern shops and other woodworking departments—that the following suggestion, from the *Chemical Gazette*, will be found interesting: "In hard soldering with borax direct there are several little difficulties encountered. In the first place the salt forms great bubbles in contact with the soldering iron, and easily scales away from the surface of the parts to be soldered. Besides this, the parts must be carefully cleaned each time prior to applying the salt. All these difficulties vanish if, instead of borax, we use its component parts, boric acid and sodium carbonate. The heat of the soldering iron acting on these causes them to combine in such a way as to produce an excellent flux, free from the difficulties mentioned."

A. Clement, of Paris, who operates one of the largest automobile factories in France, is at present placing substantial contracts for American machine tools. His representative is expected to arrive in the United States shortly with a view to making further purchases of machinery.

The Louisville & Nashville Railroad has contracted with Eastern locomotive builders for the delivery of seventy-five engines in July, August and September at a cost of $1,125,000. Ten locomotives which were to have been delivered to this railroad last December have just been received.

THE CUTTING ANGLES OF TOOLS.*

BY H. F. DONALDSON, OF WOOLWICH, ENGLAND.

The importance of the study of the elements which rule speed and feed cannot fail to be recognized by any one interested in matters relating to engineering manufactures, and the author believes that one of the first of these elements, and one which has by no means received the attention which it deserves, is that relating to the individual and combined angles of the tools themselves. Without a fairly clear knowledge of the effect of such combinations, it is a practical impossibility to speak with certainty about absolute speeds which might and ought to be attained under given conditions. What a tool will do, and the angles it requires, will be found to depend upon: (1) the material of which it is made; (2) upon the nature of the material to be cut; (3) upon the speed it is desired to work at; (4) the depth of cut; and (5) the feed.

In the experiments hereafter quoted the tools were all either of ordinary self-hardening steel or ordinary tool-steel, and the materials cut were such as were in daily use in the shops in which they were carried out. These materials, of course, have varying degrees of hardness, and for purposes of comparison tables will be found herewith in which the chemical analysis, or the leading features thereof, and the mechanical tests for each specimen are set out.

It is, perhaps, well to mention here that up to the present no special trial to investigate the best cutting angles for the recently introduced rapid-cutting tool steels have been undertaken on similar lines. A large number of tools of that nature have been tried, but, as the requirements and the conditions demand as much similarity as possible, it naturally followed that the shapes of tools were kept as uniform as possible. Incidentally, however, these experiments showed that these new steels require more obtuse angles, as well as stouter scantling. This is what would be expected if data obtained with ordinary tool-steel was used as the basis for arriving at the correct angles. Further reference will be made to this point later.

In shops where workmen grind, and always have ground, their tools for themselves it will generally be found that from long experience and by trial and error, the best workmen have arrived at a fairly close approximation to the combination of tool angles to suit the work they have to do; but it is by no means common to find one who can name the angles at which he aims when grinding, and still more rare is it to find one who is provided with any means of checking the correctness of his grinding, if he knows exactly what he wants. This is one of the great objections to hand grinding; but with machine grinding accuracy in this respect can be fully assured; and for this reason, if for no other, machine grinding should, in the author's opinion, be adopted to the entire exclusion of all hand grinding in the future. There are, of course, many other reasons which could be advanced in support of the plea for reform in this direction, but the present paper does not seem the proper place to produce them; it will suffice to point out that, in order to secure efficient results from the use of such investigations as these, machine grinding must be used.

The variation in the tool angles is always dependent on the nature and hardness of the material to be cut; this is specially the case in the cutting angles, but the influence and effect of the depth of cut and the fineness or coarseness of the feed must not be overlooked. There are indications in the experiments that a light cut and a fine feed should be attacked with a sharper angle than would be permissible with a heavy cut and a coarse feed. Experience, both during the investigation and subsequently, goes to show that, if the work will stand it, a heavy cut and slow speed will be more efficient in production than a light cut and quick speed, even though figures would seem to show that the result should be the same.

It will be seen that the experiments covered fourteen different qualities of material, of which seven were steel, one wrought iron, one cast iron, and five yellow metal alloys of different degrees of hardness and chemical constitution. It will also be seen that the angles of the cutting edges of tools range from 57½ degrees to 75 degrees, while the clearance angles, though showing some variation, do not appear to have the same importance. Subsequent experience indicates that these should under no circumstances be less than 3 degrees, but should be greater as the diameter of the work in the lathe increases. The experiments were all made with pointed roughing tools, Fig. 1, though in some cases (notably in specimens VI. and VII.) the point was somewhat rounded off. The angles mentioned are as follows:

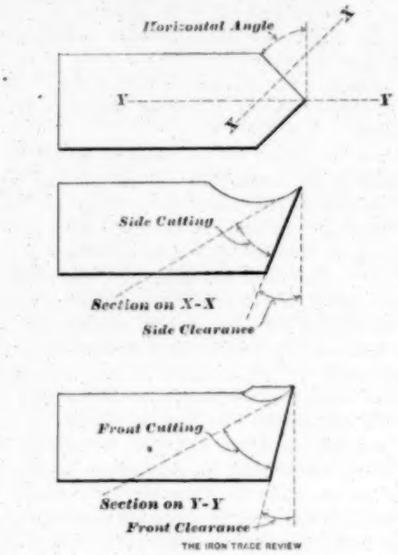


FIG. 1.—ANGLES OF CUTTING TOOL.

During the course of the experiments, it was thought desirable to secure some data with regard to the actual weight brought to bear upon the point of the tool when cutting, and a device was worked out by one of those to whose care the experiments hereafter detailed were entrusted, of which some short description may be of interest to members. It is not suggested that it is in all respects perfect, or that there are not several improvements easily open to suggestion. For instance, there are parts where frictional effects are rather large; but for the purposes for which the device was produced it was sufficiently accurate, and fulfilled its object. The apparatus may be shortly described, with the aid of the drawing, Fig. 2.

It consists of an attachment, fixed by the ordinary tool studs to the slide-rest of an ordinary lathe, forming a holder for the body of the tool to be tried. Along its front edge a knife-edge A is provided, which forms the fulcrum on which the forward portion of the tool rests; at the hinder end of the tool a stop B is arranged, also beneath the tool; the tool is primarily rested upon these two points; a set-screw C is devised to be brought to bear on the top hinder end of the tool, and is adjusted, when the tool is first inserted, to allow a certain amount of play, while preventing the tool from tilting an undue amount, when the cut is first put on; at a distance from the fulcrum A, about equal to that from the point of the tool to the fulcrum, a small ram D, having a sliding block E attached to its lower end, and capable of being moved forward by the rotation of the capstan-headed screw, housed in the ram; the cylinder into which the ram fits is part of the main attachment; and the hydraulic joint is made with a small hat-leather; into the top of the cylinder a spring gauge F is screwed. At the back of the tool a similar arrangement is provided with gauge G, the only material difference being that there is no sliding block, but the pressure is taken up on a point. The omission of a sliding block at this place, as well as at the side gauge H, is responsible for the greater portion of the frictional errors which had to be allowed for. The side gauge is arranged for on identical lines, but it may be well to eliminate this from further remark, because, owing to the friction at the end of the tool, no readings of any value were obtained. The only other moving parts are the set-screws I J disposed at each side of the tool, and in the same plane as the knife-edge fulcrum.

*Paper read before the Institution of Mechanical Engineers.

The process was as follows: The tool was laid upon the fulcrum and the stop B; the set-screws I J were given a light bearing, the set-screw C was also adjusted so that the tool could not tilt much above the horizontal; the end and side ram points were also given a firm bearing each, and the cut was put on. When the desired depth was reached, the sliding block was screwed hard down, until the axis of the tool was horizontal, and thus its contact ceased with stop B and set-screw C. The vehicle for transmitting the pressure to the gauges was oil, and the readings were direct, except that to obtain actual pressures the reading required to be multiplied by the ratio of the distance from the centre of pressure to the fulcrum, and the point of the tool to the fulcrum, seeing that it is practically impossible to fix these with exact equality.

The material operated upon was medium hard steel, the tool was an ordinary pointed one, and its angles were:

	Deg.
Front cutting	60
Front clearance	5
Side cutting	60
Side clearance	5
Horizontal	40

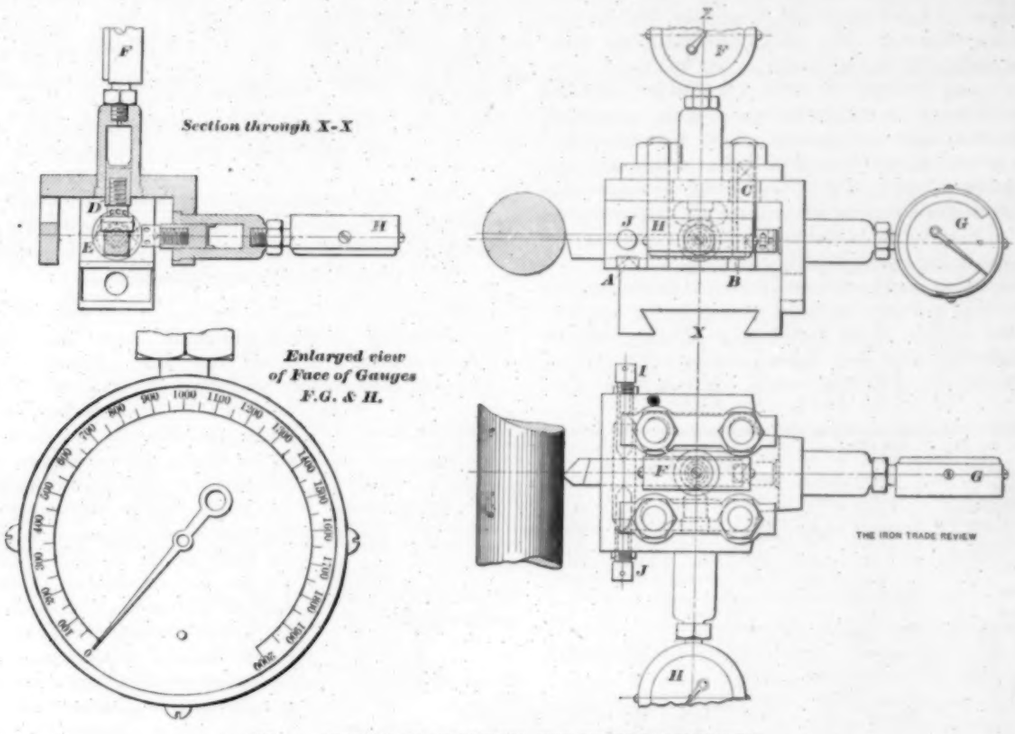


FIG. 2.—METHOD OF MEASURING THE CUTTING RESISTANCE.

The following table I. gives results of some tests:

TABLE I.

Material.		Revolutions.	Feed.	Depth of Cut.	Pressure on Top in Pounds per Square Inch.	Actual Pressure in Pounds per Square Inch.	Travel.	Pressure at End in Pounds per Square Inch.	Remarks.
			in.	in.			in.		
Medium hard steel.	A	14	1/13	0.1	75.0	81.25	.....	25	At starting of cut the pressure was 250 lb., and dropped to 150 lb.
	B	14	1/12	0.125	80.0	86.66	1	25	
	C	14	1/10	0.125	150.0	162.5	1	25	
	Speed of Material: A—14.65 ft. per min. B—14.65 ft. " C—14.65 ft. "								

It will be seen from the above that a comparatively small increase in the feed is responsible for a much more considerable increase in the pressure at the point of the tool, and that, in one experiment at any rate, there was a decided rise in the pressure at the beginning of the cut. The deductions possible from investigations of this nature will be found of great utility, in dealing not only with the steels of usual quality, but still more so if a close examination is undertaken in regard to the requisite strength of machines capable of standing up to the extra stresses likely to be brought upon them when using the newer qualities of rapid-cutting tool steels. They are, moreover, valuable in considering the shape and points of tools. As stated, pointed tools were used in these tests, and it is therefore calculable, with measurements, to compare the power required if a round tool is used. With the latter more power is of course required, but for ordinary work, which will stand the strain, the efficiency, both in length of life of the tool, and in the greater amount of metal removed in a given time, seems to give a balance of advantage in its favor. When cutting the harder natures of steel this is particularly the case, because this shape of tool has necessarily more metal in it, and consequently takes up heat less quickly, and also when hot has a greater area from which to get rid of it; moreover, being stronger, it is less liable to chip. Allied to this matter of strength is the subject of the method of fixing the tool in its rest; this is of much importance, for the more rigidly the tool can be fixed the better will it cut, and the longer will it last. For this reason the nearer the point of the tool can be fixed to its rest the better; to attain this to the greatest extent possible, it will be necessary to use straight-bodied tools, and to avoid adopting tools forged with a bend or spring towards the point. "Spring" in a tool, with its attendant evils, should be avoided wherever possible. The pointed tool, however, has its distinct advantages under certain conditions, as, for example, the experiments hereafter quoted seem clearly to indicate that it is better for light cuts and fine feeds. When using tools of rapid-cutting steel there is no doubt that the straight, heavy, round-nosed tool is the best.

Turning now to table III., showing results of experiments with various combinations of tool angles, speeds and feeds, the author has thought it undesirable to burden this paper with a complete list of all experiments, and therefore only enumerates the "best results." He gives two tables—table II. containing the chemical analysis and mechanical tests, and table III. the depths of cut, the speeds of material and tool, the angles of tools, the states of tools after work, the qualities of shavings, and the appearance of the work. Both tables indicate the assessed degree of hardness.

It would be impossible within the limits of such a paper as this to embark upon anything like an exhaustive analysis of the data these tables afford; and the author therefore proposes, while remarking upon a few points, to confine himself to inviting attention to the conclusions he has drawn for him-

self. He has already referred to the more important of these. For instance, the tests indicate that when working with a high speed of material, a light cut, and a fine feed, different angles are required to those found most suitable for a heavier cut, a slower speed of material, and a coarser feed. Having special reference to this point, specimens II. and VI. are worth noticing. Both of these are similarly classed as regards hardness, and there is only a difference in the respective cutting angles of 4 degrees.

The ruling factor, in fixing cutting angles, must in all cases depend, to a very large extent, upon the hardness of the metal to be cut; the harder the metal the more obtuse will be the angles of the tool. Thus, in specimen II., classed as H, specimen V., classed as H H, and specimen I., classed as H H H, with a tolerably even gradation in speed of material and lightness of feed, the best cutting angles appear to be 59 degrees, 62 degrees, and 75 degrees, respectively. In each of these examples the depth of cuts and the nature and size of tools are approximately the same. Similar evidence is forthcoming on examination of specimen VI. and VII.; the material in both these cases is the same, but the latter is oil-hardened. The softer material clearly requires the sharper angle of tool; but for purposes of finish the feed is rather finer, and this supports the suggestion that, other things permitting, the variations in the angles are closely allied to speed and feed.

It will be noted, especially in connection with operations on yellow metal alloys, that the possibilities of speed of working on hard, medium, and soft material rise in accordance with the nature of the material; but that with medium and soft material, specimens XI. and XII., no change of angles was necessary; from this it may be deduced that the tendency of the soft metal to hang to the point of the tool is responsible for the obtuseness in the required angle.

The information gathered from these investigations has not been without practical results in several subsequent steps. It has tended to assist in the consideration of more than one subject connected with shop administration, with, as the author believes, very beneficial results. Among other good

TABLE II.—CHEMICAL ANALYSIS AND MECHANICAL TESTS OF MATERIAL OPERATED UPON.

Material, Index Number and Degree of Hardness. (See Table III., page 126.)	Chemical Compositions.								Mechanical Tests	
	Carbon.	Silicon.	Manganese.	Nickel.	Phosphorus.	Sulphur	—	—	Ultimate Stress in Tons per Square Inch.	Extension per Cent. in a 2-in. Length.
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent				per cent.
I. Steel HHH	1.1 to 1.35	..	..	..	..	..	..	..	55 to 60	10 to 15
II. ,, H	0.6 ,, 0.75	..	..	..	..	..	..	..	45 ,, 52	12 ,, 15
III. ,, HHN	0.6	0.2	0.5	0.5	..	..	..	..	50 ,, 60	10 ,, 15
IV. ,, cast HH	0.35 ,, 0.45	0.2 to 0.3	0.7 to 0.9	..	..	..	..	..	28 ,, 38	4 ,, 9
V. ,, HH	0.3 ,, 0.35	0.1 ,, 0.2	0.5 ,, 0.7	..	..	..	..	..	33	20
VI. ,, H	0.33	0.06	0.54	..	0.04	0.02	..	..	31	23
VII. ,, HO	.33	0.06	0.54	..	0.04	0.02	..	..	39	20.5
VIII. Wrought-iron M	0.08	trace	trace	..	..	..	..	..	22 to 25	40 to 60
IX. Cast iron	0.36	0.25	0.7	..	0.1	..	..	..	10 ,, 12	
	Copper.	Tin.	Zinc.	Lead.	Phos. Tin.	Aluminium.	Iron.	Manganese.	—	—
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent	per cent	per cent		
X. G.M. hard alloy, HH ..	90	8	2	..	2	..	..	..	19.5	30
XI. ,, medium alloy, M ..	87 ± 2	3.5 ± 1	6 ± 2	3.5 ± 1	..	..	..	..	14.5	28
XII. ,, soft alloy, S* ..	87 ± 2	3.5 ± 1	6 ± 2	3.5 ± 1	..	..	..	..	14.5	28
XIII. ,, forged alloy, HH ..	60	..	40	..	..	0.25	0.25	2	27	22
XIV. ,, ,, alloy, H ..	60	..	40	2	..	0.25	..	..	32	35

* Chiefly old metal.

objects it affords a reasonably sound basis for determining the cutting speeds with which those in authority may be content; it therefore will naturally be available and useful in the formation of estimates, whether for rate-fixing, promises for delivery, or quotations to customers. It can also be used for the assistance of the workmen in the shop. Rule of thumb, and practical experience, of course, have their value in dealing with such subjects; but, in the writer's opinion, workshop administration can be, and ought, in these days, to be based upon a more defined foundation. This can be much assisted by a study of anything which appears to contain an approach to definite laws. The author believes that a careful study of matters relating to cutting angles of tools will fully repay the trouble.

A practical illustration of how beneficial results have occurred, in one place at any rate, may, perhaps, be of interest and useful. In a shop which was occupied on repair work, and equipped with a considerable number of lathes, the cutting speeds in general use were very variable, more so than the changes of the work required seemed to warrant. The workmen ground their own tools, and so long as that remained the practice it did not seem feasible to formulate definite instructions as to the cutting speeds at which the men would be expected to work. Machine grinding was introduced, and tools at approved angles were prepared for issue to the men as required. From the data of the experiments determinations were made for the best speeds for cutting all classes of material in general use, using 1 inch diameter as the constant, and the following letters were adopted to indicate the different classes of material:

S. V. H. means steel very hard.
S. H. means steel hard.
S. M. H. means steel medium hard.
S. T. means steel tough.
S. S. means steel soft.
I. W. means iron wrought.
I. C. means iron cast.
B. H. means brass hard.
B. S. means brass soft.
B. F. H. means brass forged hard.
B. F. S. means brass forged soft.

A small brass plate was prepared for, and attached to, each machine, bearing figures denoting the determinations referred to, and of the following form:

Material.	Revs. for 1-in. dia.
S. V. H.	58
S. H.	84
S. M. H.	102
S. T.	107
S. S.	105
I. W.	210
I. C.	80
B. H.	468
B. S.	860
B. F. H.	615
B. F. S.	530

The face of each step on the cone pulleys was stamped with the number of revolutions the spindle would make when running with single, back, and triple gear. Armed with the information which these permanent markings afford, the adjustments to be made become a very simple operation for the workman, for all he has to do, to at once start his machine at its correct speed, is to divide the number of revolutions for 1-inch diameter by the diameter in inches of the work to be operated upon, which will give him the number of revolutions required, and he can at once arrange his belt on the necessary step of his cone pulley. Besides the advantages accruing from such a method, other benefits may be mentioned; for instance, the foreman in charge can at a glance tell if the work entrusted to him for execution is being arranged by the workman at speeds which will ensure his estimate both for time and cost resulting. Such a display of proof of sound shop administration will be reflected on the workman, and cannot fail to act beneficially on the productions of the shop. The author has referred to the possible charge that the results of the experiments show a want of finality which may mar their efficiency; he is fully alive to the possible soundness of such a criticism, but at the same time hopes that the data offered may yet afford a basis from which others may start in the selection of tool angles most suited to their own special requirements. He believes that variation in practice in individual shops will be found to materially affect the determinations as to the best tool angles. With this in view, he has less hesitation in offering the following table of margins based upon the experiments, even though their wideness may be considered to almost defeat the attainment of the object in view.

The criticism that these margins are too wide for practical use will best be met by the acknowledgment that the author has, perhaps, endeavored to compass the variable requirements within too narrow a limit; but he would point out that it would unduly prolong the paper to attempt to embark upon all the possible contingencies which he believes would arise

when considering the requirements of a particular shop. The large allowance in the margins is also made in order to cover variations in degree of toughness (as distinct from hardness), variations in depth of cut, speed of material, speed of feed, and form of tool. The author is well aware that the subject could readily be expanded by closer examination of details; but he hopes that the remarks he has made may be the means of raising such discussion as will tend to a closer examination of the principles, which he believes underlie, and matters which depend upon the subject under review than is, he thinks, generally given to them.

In conclusion, the author desires to express his thanks to all those, especially those in administrative control of departments and shops where the experiments were carried out, and particularly to those who brought special devices and appliances to bear, to assist in the attainment of the desired information.

TABLE III.—SHOWING BEST RESULTS IN OPERATING ANGLES OF TOOLS.

Material, Index Number, and Degree of Hardness.	Diameter. Before.	Diameter. After.	Speed of Material. Revolutions per Minute.	Speed of Material. Feet per Minute.	Speed of Tool. Feed.	Speed of Tool. Travel.	Speed of Tool. Time.	Tools and Angles. Nature of Tool.	Front Cutting.	Side Cutting.	Front Clearance.	Side Clearance.	Horizontal.	Lubricant Used.	State of Tool-Edge after Work. Not Damaged.	Slightly Damaged.	Completely Damaged.	Striation. Long.	Striation. Short.	Surface of Specimen after Work. Smooth.	Rough.	Very Rough.
	in.	in.			in.	in	min.	in.	deg.	deg.	deg.	deg.	deg.									
I. Steel, HHH	3.4	3.2	18	15	1/32	3	6.75	1 C.S.	75	60	2	2	33	Soda hyd.	..	Yes	..	..	Yes	Good		
II. Steel, H	1.85	1.7	70	32	1/16	6	6	,,	59	60½	3	3	33	,,	..	,,	..	Yes	..	,,		
III. Steel, HHN	5.75	4.05	18	27	1/16	3	9	,,	62½	60½	1	1	32	Soda hyd. & soap	..	Rough on edge	..	..	Yes	,,		
IV. C. Steel, HH	6	5.15	18	25	1/16	1	2.25	,,	66	63	2½	1	42	,,	..	,,	..	Long	..	,,		
V. Steel, HH	1.5	1.25	70	27½	1/16	1	0.44	,,	62½	62½	3	3	42	,,	Not	,,	..	Yes	..	,,		
VI. Steel, H	8.35	7.5	8½	12	1/8	10	15	1½ Mu.	56	53	4	5	35	,,	,,	,,	..	,,	..	,,		
VII. Steel, HO	6.75	6.25	8½	10	1/16	18	44	,,	57½	55	8	8	60	,,	,,	,,	..	,,	..	,,		
VIII. W iron, M	3	2.75	70	65	1/16	2	2	1 C.S.	57½	56	3	3	42	,,	,,	,,	..	,,	..	,,		
IX. C. Iron	4.95	4.3	18	21	1/16	2	3	,,	60	64	1½	1	35	Nil	..	Yes	..	..	Yes	,,		
X. G.M.F., HH	3.37	3	140	122	0.02	4	1.45	,,	61	64	3	0	35	Soda hyd.	Not	..	..	Yes	..	,,		
XI. G. Metal, M	2.6	2.37	320	217	0.03	6	0.6	,,	61	64	3	0	35	Ditto	,,	..	..	..	Yes	,,		
XII. G. Metal, S	3.5	3.26	320	293	0.05	5	0.5	,,	73	74	2	5	35	Nil	,,	..	..	..	Yes	,,		
XIII. M. metal, F; HH	2.65	2.45	224	160	0.02	4	0.75	,,	73	73	1	0	35	Soda Hyd.	Not	..	..	Yes	..	,,		
XIV. G. metal, F; H	2.4	2.125	224	140	0.02	3	0.55	,,	62½	60	3	3	35	Ditto	,,	,,	..	..	..	,,		

HHH.—Very hard material indicated. HH.—Medium hard material indicated. H.—Hard material indicated. O.—Oil-hardened material indicated. M.—Medium material indicated. S.—Soft material indicated. F.—Forged material indicated. N.—Nickel material indicated. Mu.—Musket material indicated.

Appendix.

Some pressure has been brought to bear upon the author to afford some information regarding tests made under his direction with the newer classes of rapid-cutting tool-steels as an addendum to the foregoing paper; he has much hesitation in doing this because the experiments were made with a view to the selection of steels most likely to meet the requirements of the work which has to be done on the material generally used; and, consequently, it is difficult to avoid reference to the firms from which the steels were procured. He does, however, feel that he can not entirely refuse the request, as he is fully alive to the great desirability for the widest possible dissemination of information on this subject. He will therefore endeavor to formulate some remarks which will assist in this direction to the greatest extent possible without disclosing the names of the makers of the steels with which he has experimented up to the present.

TABLE IV.—LIMITS OF CUTTING ANGLES.

	Front Cutting.	Side Cutting.	Front Clearance.	Side Clearance.	Horizontal.
	deg.	deg.	deg.	deg.	deg.
For cutting mild steel	52 to 60	50 to 60	3 to 8	3 to 8	33 to 43
For cutting medium steel	54 to 63	60 to 65	3 to 8	3 to 8	33 to 43
For cutting hard steel	65 to 78	60 to 70	3 to 8	3 to 8	33 to 43
For cutting soft yellow metal	62 to 74	62 to 74	3 to 8	3 to 8	33 to 38
For cutting medium yellow metal	62 to 74	70 to 75	3 to 8	3 to 8	33 to 38
For cutting hard yellow metal	60 to 80	60 to 80	3 to 8	3 to 8	33 to 38

TABLE VI.—RAPID-CUTTING TOOL STEEL TRIALS.

Index Mark of Brand.	Nature of Material Cut.	Cutting Speed in Feet per Minute.	Depth of Cut.	Feed of Tool per Revolution.	Weight of Material Removed.	Average Time of Cutting.	Condition of Tool.
			in.	in.	lb. per hour.	hrs.	
A*	Very hard.	17.0	0.25	0.063	25.6	12.5	Point broke due to accident.
B	,,	17.0	0.25	0.046	20.48	5.8	Required grinding.
C	Hard,	42.0	0.41	0.10	350.0	13.5	Ditto.
D	oil	50.0	0.26	0.1	269.7	8.5	Good.
E	hard-	33.0	0.6	0.076	229.0	7.1	Required grinding.
F	ened.	38.5	0.27	0.1	217.3	4.78	Slightly worn.

* Lathe broke down owing to insufficient power.

TABLE V.—RESULTS OF TRIALS OF HIGH-SPEED TOOL STEELS COVERING A PERIOD OF FROM SEPTEMBER, 1901, TO NOVEMBER, 1902.

Name of Steel.	Cutting Speed in Feet.	Depth of Cut.	Feed of Tool per Revolution.	Weight of Material Removed per Hour.	Average Time of Cutting.	Travel of Tool.	Condition of Tool after Test.	Order of Merit of Tool.	Nature of Material on which Best Result was Obtained.
	per min.	in.	in.	lb.	hours	in.			
W	17	0.25	0.046	20.48	0.116	3.43	Requires grinding	..	Only tried on cast steel.
I	17	0.25	0.046	21.175	2.405	15	Ditto	..	Soft steel.
	38.6	0.35	0.1	281	7.6	..	Ditto	..	Ditto.
	13.5	0.5	0.05			..		..	Ditto.
E	17	0.25	0.046	18.45	1.315	7.8	Requires regrinding	..	Ditto
	38	0.6	0.076	229	7.1	..	Ditto	Third soft steel	Ditto
	13.5	0.93	0.05	80	9	..	Good	..	Ditto
B	17	0.25	0.046	20.48	5.8	72	Requires regrinding	Second hard steel	Suitable for soft and hard steel.
D	50	0.26	0.1	269.7	8.5	..	Good	Second soft steel	
J	13.5	0.93	0.05	148	4.66	..	Good		
K	13.5	0.93	0.05	143.5	4.25	..	Good		
L	13.5	0.93	0.05	128.5	4.8	..	Fair		
N	13.5	0.93	0.05	80	9	..	Bad	..	Medium steels
	39.5	0.238	0.008	176	2.85	..	Requires regrinding	..	
M	13.5	0.93	0.05	80	9	..	Good	..	Medium steel.
	35	0.2	0.1	143	0.106	..	Requires regrinding	..	
O	37.3	0.215	0.1	179.2	3.95	..	Ditto		
R	28	0.15	0.08	78.3	1.62	..	Ditto		
A	44.5	0.33	0.1	313	4.12	..	Fair	..	Cast steel.
	17	0.25	0.063	25.6	12.5	214	Point broke due to accident	First hard steel	
S	17	0.25	0.046	19.98	3.71	41	Requires regrinding		
T	17	0.25	0.046	19.75	1.37	15.5	Ditto		
Y	Would not cut at all at either feed.								
Q	17	0.25	0.062	25	0.35	6	Requires regrinding		
F	39.25	0.244	0.1	190.1	3.04	..	Edge worn away	Fourth soft steel	Medium steels.
	38.5	0.27	0.1	217.3	4.78	..	Cutting edge slightly worn		
	13.6	0.94	0.05	180.6	2.42	..	Good		
V	13.5	0.94	0.05	166.8	0.83	..	Bad		
X	26	0.1	0.008	4.25	0.25	..	Fair		
C	28	0.2	0.02	24	0.116	..	Edge worn off tool		
H	42	0.41	0.10	350	13.5	..	Requires regrinding	First soft steel	Soft steel.
	43.75	0.25	0.1	227.3	5.5	..	Good		
G	21	0.2	0.047	40	1.34	26.75	Requires regrinding	..	Ditto.
	42	0.367	0.1	321.7	2.75	..	Ditto	..	Suitable for soft and hard steels.
P	21	0.2	0.047	39.7	3.64	73.5	Ditto	..	
	35.5	0.15	0.1	114	3.5	..	Ditto		
	21	0.2	0.047	20.7	2.42	51			

Twenty-seven different brands of steel have been tried, and in many of these under several sets of conditions. Table V. (annexed) shows 24 of these, and from them six have been selected as most satisfactorily meeting requirements. Table VI. sets out some of the leading features; the brands are indicated alphabetically.

It is very evident from the trials made that the rapid-cutting tool-steel, which is best for cutting mild material, is by no means certainly the best for cutting very hard material, and *vice versa*. Consequently, in examining the question, or in selecting a rapid-cutting steel, it is essential to take into consideration the nature of the material to be cut.

It will be noticed that only two brands are selected for working on hard steel, while four are found suitable for medium or mild steel. This is, no doubt, due to the fact that, generally speaking, medium or mild steel is dealt with in most shops; and, consequently, steel makers have aimed at supplying general requirements, and it is therefore easier to get a greater area of supply in grades of this quality. The author does not propose to comment at any length on the above table, but thinks that he may usefully draw some comparisons with regard to the weight of metal removed, between

these tests and some of the experiments dealt with in the body of the paper, where the relative degrees of hardness coincide.

The material in specimen I. in table II. was of about the same degree of hardness as was operated upon by tools A and B in table VI. The material removed from specimen I. was equal to about 7½ pounds per hour, while tools A and B removed about 25½ pounds and 20½ pounds per hour respectively. Specimen VII. would represent equivalent hardness of material for comparison with that operated upon by tools C, D, E, and F. The metal removed from specimen VII. was about 35½ pounds per hour, while tools C, D, E, and F removed 350 pounds, 269 pounds, 229 pounds, and 217 pounds per hour, respectively. This comparison brings out the interesting point that while the new rapid-cutting tool-steels show speeds of work from six to nearly ten times faster than when working with ordinary tool-steels, speeds only about three times faster can be attained when working on the harder qualities of material. It is difficult to account for this, except by the theory that steel-makers have directed their attention more exclusively to meeting the demands for quick removal of large weights of mild or medium hard metal; at the same time, there is reason to think that many steel makers have not in all cases realized that tools for operating upon very hard material must possess special qualities.

Remarks in the body of the paper have already been made indicating that a round-nosed tool will, other things being equal, give better results in the amount of metal removed than a pointed tool. This is very marked in the case of rapid-cutting tools, for not only are the latter stiffer and stronger, but they stand up to their work better and are more durable. No special experiments have been made as to cutting angles for these tools, but experience seems to show that the cutting angles should be a few degrees more obtuse than is required for tools of ordinary steel.

In conclusion, it seems desirable to draw attention to the fact that in considering the quantities of metal removed in the two sets of experiments, true comparisons are not possible, because in the tool-angle experiments no effort was made to test the tool to destruction, while in the rapid-cutting trials such an end was actually aimed at.

The American Seeding Machine Co.

Details regarding the American Seeding Machine Co., which was recently incorporated under the laws of New Jersey with a capital of $15,000,000, have been made public. It is officially announced that the company has purchased the property and business of the following: Superior Drill Co., Springfield, O.; Hoosier Drill Co., Richmond, Ind.; Empire Drill Co., Shortsville, N. Y.; Brennan & Co., Louisville, Ky.; Bickford & Huffman Co., Macedon, N. Y. The directors chosen for the first year are: Edward L. Buchwalter, Frank C. Johnson, Burton J. Westcott, James A. Carr, George McNeir, A. M. Bentley, Severn P. Ker, R. H. Rodgers and W. G. Munn. The officers are: E. L. Buchwalter, president; James A. Carr, first vice president; W. G. Munn, second vice president; F. C. Johnson, third vice president; Burton J. Westcott, treasurer, and F. G. Colley, secretary.

While no action was taken, it is generally understood that the headquarters are to be at Springfield, O. A representative of the company made a statement, in part as follows: "The company will devote its time and efforts to the manufacture of seeding machines. Other lines of standard goods will be added as opportunities and facilities permit. It is the expectation of the company that it will be able to continue the manufacture and sale of seeding machinery without having to increase prices. The advance in prices of all kinds of materials and labor has added very greatly to the cost of agricultural implements of all kinds, which makes it either necessary to advance the selling price or decrease the expenses, and it is believed through this method the present prices may be maintained, or possibly lowered."

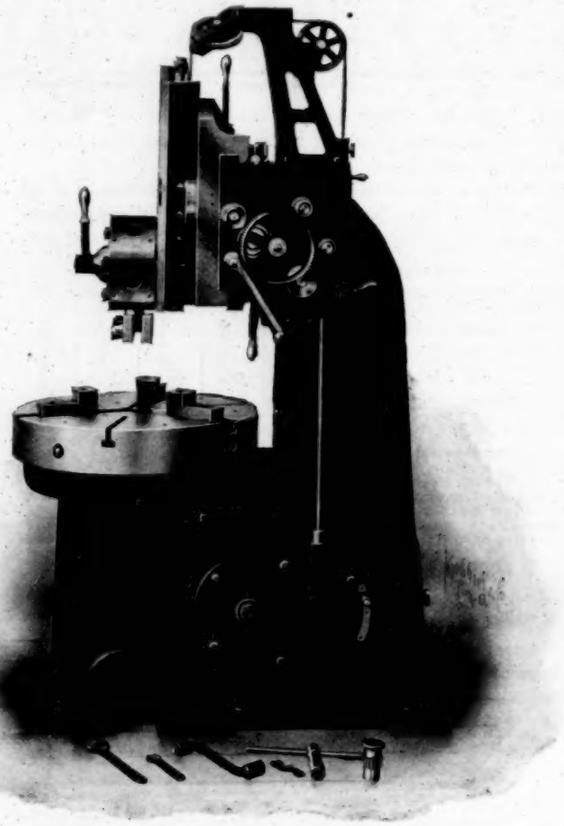
The Atlas Engine Works, Indianapolis, Ind., have secured a fair-sized boiler order from Rio de Janeiro, Brazil.

COLBURN BORING AND TURNING MILL.

The Colburn Machine Tool Co., of Franklin, Pa., has brought out a line of vertical boring and turning mills for which the Brown & Zortman Machinery Co., of Pittsburg, is exclusive sales agent. A view of the 34-inch machine is shown in Fig. 1. This mill swings full 34 inches in diameter and will take 14 inches under the cross rail, while the extreme height from chuck to turret is 22 inches.

The bed is an extra heavy one-piece casting having the inside heavily ribbed and has a door at rear which permits inspection of the gearing without dismantling the machine. The turret slide has a travel of 18¾ inches and is equipped with automatic adjustable stops for tripping the feed and means to clamp same to the swivel. A counterbalance weight is suspended within the column and attached to the slide allowing an easy running movement. The turret itself is five-sided and is bored out to take as many tools. The slides have tapped holes for clamping special tools to turret. The clamp lever is so attached that when released it remains in a vertical position.

The spindle is 6 inches in diameter and runs on a bronze shoulder ring. The driving gear is made fast to the chuck



A NEW BORING AND TURNING MILL.

so that no twisting strain comes on the spindle. The chuck has three jaws which may be used universally or have independent adjustment and is of very substantial design. The jaws are scored underneath to prevent any possibility of slipping.

The back gear and all the driving gears are enclosed within the main frame and well protected from dust. The cross slide has a travel of 15 inches, automatic adjustable stops for tripping the feed and is also provided with means for clamping the slide to rail within easy reach of the operator and without need of a wrench. The vertical feed rod on the side of the machine drives a long pinion through worm and worm gear, as shown on one of the detail illustrations. The automatic stop is arranged to disengage the worm and worm wheel, and is either operated by the vertical or horizontal feed.

On the long pinion is an idler gear, supported by the sliding bracket, which uses the gear case itself as a bearing. By raising the latch in notches A, B, C or D the idler engages in any one of four gears on a shaft above. This gives four changes of feed, and, by moving the lever shown either to-

wards fast or slow, as indicated on plate, a positive clutch is operated that changes the speeds as given on index plate. The lever which is shown at the bottom of the feed shaft in the general views of the machine, changes the direction of feed or stops it altogether. In this way a positive drive is given the

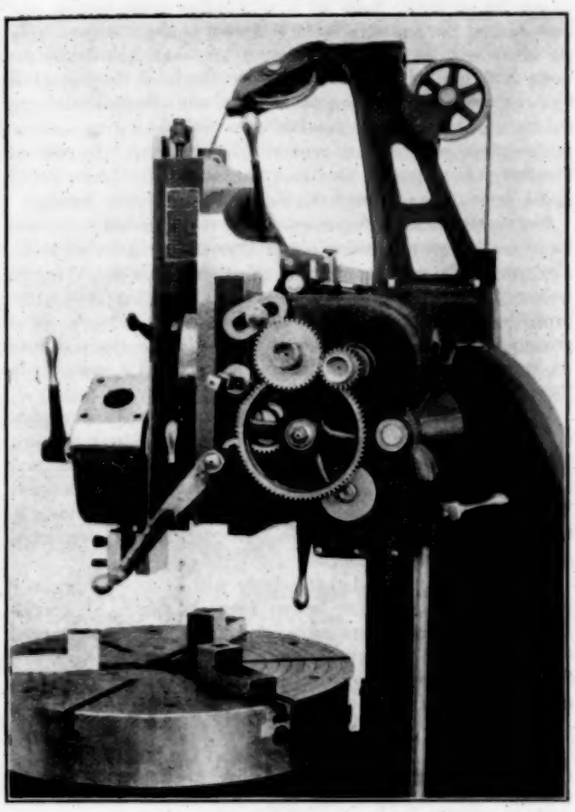


FIG. 2.—VIEW OF SCREW CUTTING DEVICE.

machine for the feed mechanism and any one of the feeds can be obtained instantly.

All the feeds are positive, gear driven, and both vertical and horizontal have automatic adjustable stops. There are eight changes for each speed of the cone. The changes are effected by means of two levers, the one giving four changes and the other lever then increasing them by four to one. The entire feed mechanism may be stopped, started or reversed, by means of a hand wheel located at the base of the machine. The feeds may be stopped at five different points in the train, by using the feed trip lever, by withdrawing the pinion on feed screw or feed shaft, by dropping out the feed change lever, by placing the feed increase lever or feed reverse lever in a central position. The feeds are as follows, the terms being in revolutions of the chuck to one inch feed: Vertical, 80, 64, 48, 32, 20, 16, 12, 2; horizontal, 40, 32, 24, 16, 10, 8, 6, 4. A neat brass index plate is fastened to the machine to indicate the rate of feed and the plate has been located in clear view of the operator.

The screw cutting attachment may be quickly applied or may at pleasure remain permanently attached to the machine. A bank of gears are provided to cut from 4 to 14 threads per inch, including 11½. This attachment can be used on any of the machines of this make without extra labor to apply it. Fig. 2 shows a view of the screw cutting device and Fig. 3 illustrates the feed box.

The countershaft runs 72 and 200 R. P. M., and has one 16 inch and one 20-inch pulley, the latter for a 1-inch belt. The net weight of the 34-inch mill is 5,500 pounds and the shipping weight, crated, is 5,800 pounds.

The Taft-Peirce Mfg. Co., Woonsocket, R. I., maker of fine machinery by contract, has passed into the hands of a receiver who was appointed on petition of a majority of the stockholders and creditors. The company was incorporated in 1901 with a paid up capital of $300,000. The officers, directors and stockholders are New York and Washington capitalists.

NOTES ON THE DESIGN OF RIVETER YOKES.*

BY CHESTER B. ALBREE.

There are three principal methods of driving rivets—by hammering by hand and finishing with a set or "snap"; by hammering with a pneumatic hammer, a device having a rapidly moving piston, striking several hundred blows a minute on a suitable die, or snap, inserted in the end of the cylinder. This is a quite recent method, but for field work is rapidly superseding hand riveting. The large majority of rivets for structural, boiler and plate work, however, are driven by machines which squeeze or upset the blank rivet end to form a head. Compression riveters are of several distinct types; the oldest form is the hydraulic riveter, consisting of a cylinder and piston or plunger, operated by high pressure, carrying a suitable die. The work to be riveted is placed between the jaws of the machine, the made head resting in a suitable die, attached rigidly to the jaw or stake of the machine. Other machines are of the same general type, differing in the means for applying the power and the kind of motor fluid, as, for instance, direct steam-driven or air-driven. Toggle joint devices, actuated by air, steam, electricity or belts. A late design uses an air cylinder, acting as a hydraulic intensifier, with provision to give a considerable travel at low pressure, followed by a short travel at high pressure.

In all of the compression riveters, of whatever type, the moving die is on one leg or jaw, and the pressure reaction is taken up by an opposed jaw. In general, the form resembles a letter U, the two legs being either in one piece or united by bolts.

This paper will discuss the design of a pneumatic toggle joint riveter, of 12-foot gap, made in one steel casting, of sufficient stiffness to drive rivets 1¾ inches in diameter.

The pressure required to close hot soft steel rivets has been

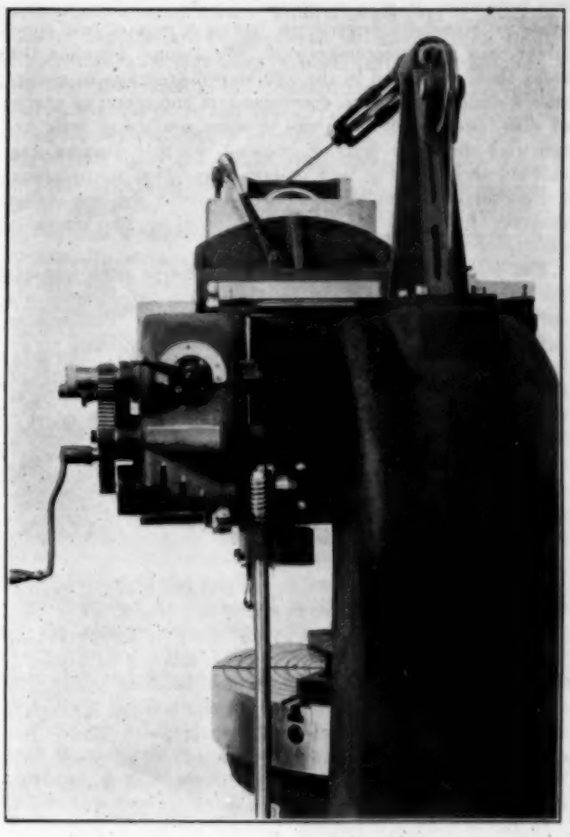


FIG. 3.—THE FEED BOX.

determined quite accurately by Sellers & Co., of Philadelphia, by means of experiments with a hydraulic press, with pressure-recording attachment. These tests have been fully described in the technical press in the past.

The net working result is that to close ordinary soft steel

* Abstract of paper read at January meeting of Engineers' Society of Western Pennsylvania.

rivets, at bright red heat, with a round or button head, a pressure of 150,000 pounds per square inch of rivet section is required. For large rivets used in boiler work it is customary to heat the rivets as hot as possible, without burning them, in order that the material shall flow easily and completely fill the rivet holes. Under these conditions less power is required to close them, and a pressure of 129,000 pounds per square inch, rivet section, has been found ample. The pressure required to drive a 1¾-inch diameter rivet, with round heads, is therefore the area 2 and 4-10 square inch by 125,000 pounds, or 297,600 pounds—say, in round numbers, 300,000 pounds.

With the type of toggle joint used, assuming a cylinder 18 inches diameter, 12-inch stroke, with air at 80 pounds pressure, we have a total cylinder pressure of 20,320 pounds, or, in round numbers, 20,000 pounds. A force diagram shows that the strain, when upper end of the side links have traveled 13-16 of the total distance, is about 15 times the cylinder pressure, or 300,000 pounds—the required amount. The corresponding travel of the ram is within 1-16 inch of its total travel of 5 inches, or practically the whole distance; hence the rivet head is practically finished at this point. In toggle joints the final pressure becomes theoretically infinite and the plunger travel zero. The actual pressure on the rivet, however, is measured by the stiffness of the yoke, which yields somewhat under the stress.

In designing the yoke we aim to get the required stiffness with the least weight, and assume that with yokes of well-annealed open-hearth steel castings, we may safely use unit strains of 10,000 pounds tensile and 14,000 pounds compressive. Castings, pulling 60,000 to 65,000 pounds, with elastic limit of 30,000 to 35,000 pounds, are used. The gap being 12 feet, or 144 inches, the depth at back of yoke was taken as 1-3 of the gap, or 48 inches. This proportion can be varied by changing the proportions of cross section, but experience has shown this proportion to give economical results. The section was made in irregular I beam form, having a tension head much larger than the compression end. We assume a section that looks about right, and by the well-known principles of graphic statics, divide it in layers, determine area and center of gravity of each, and lay off the areas to some convenient scale and construct the force diagram, making the pole distance one-half the length of the load or area line. This forms always a right-angled triangle. We then construct the equilibrium diagram, finding the resultant and locating the center of gravity of our section.

The yoke is curved where the two arms or jaws join and the exact mathematical determinations of the strains in a curved beam of this shape are very complex. The problem has been studied by several mathematicians, including an exhaustive article published last year in the transactions of the Deutches Eisenhuttenleute Verein; but in practice I have assumed that if the arm of the bending moment were taken as the diagonal from the end or nose of the jaw to center of gravity of the median section at the center of the curve, then the increase in length over the straight gap of the machine would compensate for the curvature, and actual results in practice, as well as comparison with the mathematical solution, seem to justify the assumption.

Having determined approximately the length of the moment arm, we then have our bending moment, which for a beam loaded at one end and fixed at the other, is simply Wl—or 300,000x162 inches. Next determine the moment of inertia of the assumed cross section, which may be done analytically, arithmetically or graphically. The graphic method is simplest, and we use a method shown in Molesworth's handbook, 1889 edition, which is simpler than any other. The proof is in Merriman and Jacoby's treatise on Bridges and Roofs—Part II, Graphic Statics, 1902 edition.

In the well-known formula for the section modulus—S= I/N—and for extreme fibre strains—f=M/S—we find for tension 8,749 pounds, and compression 14,460 pounds, which are safe, and as a check, and to determine the deflection we use the formula $\frac{W l^3}{3 E I}$ =deflection, using E as 29,000,000, and find the deflection of the beam.

Having fixed the median section, we design each arm to be a beam of uniform strength. Such beams may be various shapes, but the design chosen is a beam of I beam section, in general similar to the median section, varying in size according to the parabolic curve, but having the inner edge on a straight line. The exact proportion of depth, width, thickness of flanges and web might be figured exactly by a more expert mathematician than the writer, but the method adopted was to use the parabolic form for a rectangular cross section, and then finding the unit strains for different points and modifying the cross sections until these unit strains were practically the same as found for the median section. In large castings blow holes or other defects sometimes occur, and often exist inside, but by omitting as far as possible cross webs and irregularities, fairly good castings can generally be obtained. In several hundred yokes that we have had, but two or three have failed under pressure, and then from blow holes at critical points.

The riveter described is used for riveting marine boilers 10 to 16 feet diameter, having plates from 1 to 1¼ inches thick, and practically no rivets have had to be caulked to prevent leakage. For large diameter rivets it is best to allow the pressure to remain on the rivet until the steel is black, for if pressure is taken off while rivet is still red hot the spring of the heavy plates will often stretch the rivet and a leak will be the result.

In small portable riveters it is often desirable to be able to use them in other than vertical planes, for crooked work. This has been generally accomplished by a double worm gear attachment forcibly holding the yoke in any desired position. The writer devised a special form of bail, called the universal bail, to accomplish this result in a simpler manner, permitting of more rapid adjustment.

In mechanics we read that a body will be in equilibrium if supported from above or below, from its center of gravity. Hence if a riveter were suspended from trunnions passing through the absolute center of gravity of the machine it would be in equilibrium, in a vertical plane, if the axis were parallel to the horizon. If the bail, instead of having the usual straight sides, is made in the form of a semi-circle, whose center is the center of gravity of the machine, then if the bail be suspended from any point of the arc, the machine would still be in equilibrium. By suspending the bail on a trolley attached to a swivel above, the bail can be rolled around and the riveter worked at any angle in any plane. To determine the exact center of gravity in advance of actually building a machine is necessary in order to locate the trunnion axis on the body of the machine in a convenient place and to provide bosses for trunnions on the pattern.

After designing the general layout of a machine, bearing in mind the probable location of the center of gravity, we mark off on the plan various convenient parts whose weight can be determined, and ascertain as nearly as possible the center of gravity of each such portion. We then construct the force diagram and determine a line containing the center of gravity for one position. We then go through the same process, but for a position at right angles to the first, finding the center of gravity line for this position. The intersection of the two lines locates the absolute center of gravity, and as the machines are symmetrical as regards a median plane lengthways of the yoke, the determination in the third plane is unnecessary.

It is obvious that for machines having deep throats the center of gravity tends to come more nearly to a middle position between the arms. As this location does not permit of placing the trunnions without interfering with the gap of the riveter, it is necessary to add weight to the upper side, at as great a distance from the jaw opening as possible in order to locate the trunnions on the body of the machine. In practice we find that for riveters over 48-inch gap, the extra weight and bulk are so great as to make such machines impracticable.

M. T. Hannon, dock agent of the Duluth & Iron Range Railroad at Two Harbors, Minn., has issued a blue print folio giving a record of ore cargoes taken from the docks at Two Harbors in the season of 1902. The number of different vessels loaded at Two Harbors in the season was 281 and the number of trips 1,149. The total of ore loaded was 5,549,120 tons, of which 4,665,342 tons was taken to Lake Erie ports and 883,778 tons to Lake Michigan ports. The maximum cargo was taken by the schooner John Smeaton—7,576 gross tons. The average time of loading vessels was eight hours. The first clearance was on April 2 and the last clearance on Dec. 7.

Specifications for Material and Workmanship for Steel Structures.*

BY T. L. CONDRON.

The subject of specifications for steel and for workmanship for steel structures, has engrossed considerable of my time and attention during the past nine years, owing to the fact that during that time I have been constantly engaged in inspecting material and workmanship under specifications prepared by many engineers representing railroads and other large corporations. In 1901 I prepared a diagram showing the variations in the physical and chemical requirements of a large number of specifications, making a comparison with the specifications proposed by the American Section of the International Association for Testing Materials. There are a great number of more or less important variations between these specifications, and as the purposes for which the steel purchased under these specifications are all similar, it seems only reasonable that a uniform specification should be agreed upon which would reasonably satisfy all users of structural steel for ordinary structures. As it is commercially impossible for the manufacturers to make a great variety of steel, as is called for by such varying specifications, the manufacturers adopted the well known "Standard Specifications of the Association of American Steel Manufacturers," which provide for the grades of steel called "soft" and "medium." In order to please as many as possible and at the same time limit rejections under these specifications to a minumum, each grade was given a range of 10,000 pounds in ultimate tensile strength, and these ranges were made to overlap each other 2,000 pounds. Under these specifications it was only necessary for the manufacturer to exercise especial care to have his steel test, so far as possible, in this 2,000-pound range in order to have it pass for either soft or medium steel. As we are all aware, the efforts in this direction have been quite successful. This results in an effort to produce a steel that will test between 60,000 and 62,000 pounds tensile strength. As there is a greater demand for "medium" steel than for "soft" steel, the tendency is to have the steel test above 60,000 pounds rather than below, so that at present it is safe to say that our manufacturers are producing steel having an average tensile strength of about 62,000 pounds per square inch.

The next move toward a uniform specification has been in the direction of eliminating the two grades, and substituting therefor one grade of steel, which has generally been designated as "structural steel."

The specifications I submit herewith for your consideration are based upon a steel having an average tensile strength of 62,000 pounds per square inch, it having been conclusively demonstrated that our American manufacturers can supply such a steel within a reasonable variation. I have specified that the variation shall be limited to 4,000 pounds above or below 62,000 pounds as determined by the usual tests made, but that where the first tests do not fall within this 4,000-pound limit retests will be allowed, the results of which must fall within 5,000 pounds above or below 62,000 pounds, to pass the material.

Another proposition which has met with considerable favor, and has been adopted by several of our leading railroads, is to specify one grade of steel ranging from 55,000 to 65,000 pounds tensile strength, or allowing a variation of 5,000 pounds above or below 60,000 pounds. My objection to this grade is simply that the average is 2,000 pounds lower than there seems any necessity for, and its lower limit is 3,000 pounds lower than seems necessary or desirable for bridge building, where reaming should always be called for. If the working stress of steel is taken at one-half the elastic limit, and the elastic limit is assumed to be 55 percent of the ultimate strength, then for steel of 55,000 pounds tensile strength the working stress should be 15,000 pounds, while for steel of 58,000 pounds tensile strength the working stress should be 16,000 pounds.

For steel buildings it has been customary to use "medium" steel and not require reaming. This practice has been shown to be safe and satisfactory. It will therefore be difficult to get the approval of many users of steel for building purposes to agree upon a steel 5,000 pounds lower in tensile strength than what they have used successfully up to this time. They would more readily agree upon a uniform specification having 62,000 pounds as an average strength, for the majority are now specifying a steel of 64,000 pounds average, or a range from 60,000 to 68,000 pounds tensile strength.

The committee on metal structures of the American Railway Engineering and Maintenance of Way Association, of which committee I have the honor to be a member, has been working upon a uniform specification to recommend to that association for adoption, and while that specification has not been finally passed upon by the committee, there has been a great deal of correspondence on the subject, and there is good reason to hope that at the convention of that association in March next, a specification covering one grade of steel will be recommended for adoption together with a specification covering the general requirements for first-class shop work, so that when a railroad company contracts for steel work it will be possible to state that the material and workmanship shall be in accordance with the specification recommended by the Maintenance of Way Association. I have thought that a free discussion in this society of some of the features of the specifications I offer herewith would be helpful toward bringing about a uniformity in specifications for material and general workmanship.

I do not consider that it is desirable to settle upon a specification, and say that it embraces all that is good or desirable and cannot be improved upon, but I do think that it is desirable that those general features of specifications that can readily be standardized, should be made uniform; then as particular cases arise, or new methods are developed, supplementary specifications can be drawn by engineers to cover the special requirements of such cases. One other argument in favor of a uniform specification is, that in the mills and shops the eleborate and detailed specifications prepared by engineers are never seen by the men actually engaged upon the work. All that reaches them are the brief extracts shown upon the mill orders or working plans, and such general instructions as may be given to foremen by the manager or superintendent, or the inspectors. In many instances the engineer's specifications do not get beyond the contract agent of the bridge company. If, however, work is contracted for, to be in accordance with a well known, or so-called "standard specification," the men in the mills and shops at once know what is required and generally work accordingly.

I do not claim much originality about the specifications submitted herewith, except as to arrangement and selection, and in a few instances an attempt to improve or abbreviate the language used, so if you all recognize familiar clauses, perhaps first used in your own specifications, I trust the clauses will meet your approval; but perhaps there will be some that your experience has taught you are undesirable and should be eliminated or changed, in which case I hope you will freely criticise.

In conclusion I wish to advocate the reaming and planing of all steel used for main members and connections of bridges, for in my opinion it is money well spent, whether the bridge be for highway or railroad traffic. The superior fitting together of the parts secured by reaming insures increased strength of the whole structure, and the removal of the injured metal around the rivet holes, and on the sheared edges is the greatest safeguard against failure from shocks. Last summer three car loads of bridge material, including top chords, end posts, stiff bottom chords, and stringers for a 150-foot span designed by me and built under my specifications, were in a railroad wreck. The cars were thrown down an embankment and the details of the members badly bent and twisted.

*Read before the Western Society of Engineers, Chicago, Ill.

A careful examination of all this material failed to discover a single cracked plate or angle, although in some cases the material had been bent nearly double. The material was 60,000 to 68,000 pound steel and all rivet holes had been punched 11-16-inch and reamed to 15-16-inch diameter. Frequently I have seen the same kinds of material and quite as often "soft" steel, that have developed cracked angles and plates, in the rough handling during erection. In these cases, almost without exception, the cracks have been through unreamed holes.

In offering the following specifications for your consideration and discussion, I desire to express my indebtedness for advice and assistance to Mr. J. P. Snow, chairman of the Committee on Metal Structures of the Maintenance of Way Association, and to Mr. John Brunner and Mr. Andrews Allen, members of the W. S. E.

SPECIFICATIONS FOR STRUCTURAL STEEL FOR BRIDGES, BUILDINGS, ETC.

Material.

1. Steel shall be made by the open hearth process.

2. The steel when tested as described below in paragraphs 3, 4 and 5, shall show the following properties:

STEEL.	Max. % Phos. Ba.	Max. % Phos. Ac.	Max. % Sul.	Ultimate Tensile Strength (desired) Lbs. per sq. in.	Minimum Yield Point Lbs. per sq. inch.	Minimum Elongation. %	Minimum Elongation. In	Character of Fracture.	COLD BENDS.
(a) Rivets	.03	.06	.04	52,000*	25,000	28	8"	Silky	See Paragraph 4.
(b) Plates, Shapes and Bars	.04	.08	.05	62,000*	32,000	25	8"	Silky	180° flat.
(c) Eye Bars (specimen)	.04	.08	.05	66,000*	36,000	22	8"	Silky	180° around a diameter of 1 in.
Eye Bars (full size)	.04	.08	.05	62,000	30,000	15	10"	Silky	
(d) Pins & Rollers	.04	.08	.05	70,000*	35,000	22	2"	Silky	180° around a diameter of 1½ in.
(e) Castings	.04	.08	.05	70,000*	35,000	18	2"	Silky or Crys.	90° around a diameter of 1 in.

*Steel testing, on first test, within 4,000 pounds of the desired ultimate will be accepted. Steel testing, on first test, more than 4,000 pounds and not over 6,000 pounds above or below the desired ultimate, shall be retested on the same gauge. Two retests shall be made, both of which must test within 5,000 pounds of thedesired ultimate to be accepted.

3. A chemical analysis shall be made by the manufacturer from a test ingot taken at the time of the pouring of each heat of steel, and a correct copy of such analysis shall be furnished to the engineer or his inspector.

4. Rivet rods shall be tested as rolled. Rivet steel, when nicked and bent around a bar of the same diameter as the rivet rod, must give a gradual break and a fine, silky, uniform fracture, and not a sudden break with a square, crystalline fracture.

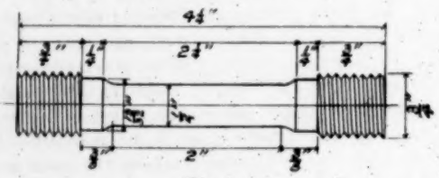


Fig. 1.

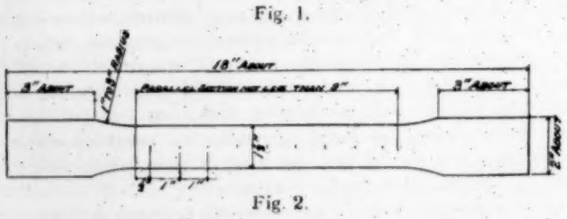


Fig. 2.

5. Pins and rollers shall be tested by cutting specimens from the finished rolled or forged bar, the center of which specimen shall be 1 inch from the surface of the pin or roller. The specimen for tension test shall be turned to the shape and dimensions shown in Fig. 1. The specimen for the bending test shall be 1-inch by ½-inch in section and may be bent by blows or by pressure.

6. Plates, shapes and bars shall be tested by cutting from the finished product coupons which shall be milled into the form of the standard test specimen, Fig. 2; or they may be turned down to a diameter of ¾-inch for the length of at least 9 inches with enlarged ends; or they may have their shear edges planed parallel.

7. Eye bars shall be tested by specimens the same as plates and shapes. Full size tests shall be made only when specified in the contract.

8. For castings, the number of test specimens shall depend upon the character and importance of the castings. A test piece shall be cut cold from a coupon to be molded and cast on some portion of one or more castings from each melt or blow or from the sink-heads (in case heads of sufficient size are used). The coupon or sink-head must receive the same treatment as the casting or castings before the specimen is cut out and before the coupon or sink-head is removed from the casting. The shape and dimensions of test specimens shall be the same as for pins.

9. At least one tensile and one bending test shall be made from each melt or heat of steel as rolled. Steel more than 25 percent thicker or thinner than that tested shall be separately tested. (**Note.**—Material from ⅜ to ⅝-inch thick would pass on the test of ½-inch material, but ¾-inch material would not.) Separate tests shall be made for: (1) plates; (2) angles and Z bars; (3) beams and channels; (4) bars and rods.

10. Finished material must be free from injurious seams, flaws or cracks, and have a workmanlike finish.

11. Every finished piece of steel shall be stamped or branded with the name of the manufacturer and the grade of steel, also with the melt number. Steel for pins and rollers shall be stamped on the end.

12. Rivet and lacing steel and other small pieces, where necessary, may be shipped in bundles with the melt number on a tag attached.

13. All material which, subsequently to the above tests at the mills, and its acceptance there, is discovered to have injurious flaws, or develops, under the shop punching or shearing or other manipulation, weak spots or brittleness, cracks or other imperfections, shall be rejected at the shop, and such material must be replaced by the contractor at his own cost.

14. A variation in cross-section or weight of each piece of steel of more than 2½ percent from that specified will be sufficient cause for rejection, except in the case of sheared plates, which will be covered by the following permissible variations, which are to apply to single plates:

15. Plates twelve and one-half pounds per square foot or heavier, when ordered to weight, shall not vary more than 2½ percent above or 2½ percent below the theoretical weight.

16. Plates under twelve and one-half pounds per square foot, when ordered to weight, shall not vary more than the following:

17. Up to 75 inches wide, 2½ percent above or 2½ percent below the theoretical weight.

18. Seventy-five inches and over, 5 percent above or 5 percent below the theoretical weight.

19. For all plates ordered to gauge, there will be permitted an excess of weight over that corresponding to the dimensions on the order equal in amount to that specified in the following table:

TABLE FOR ALLOWANCES FOR OVERWEIGHT FOR RECTANGULAR PLATES WHEN ORDERED TO GAUGE.

Thickness of Plate. Inch.	Width of Plate. Up to 75 Ins. Per Cent.	Width of Plate. 75 to 100 Ins. Per Cent.	Width of Plate. Over 100 Ins. Per Cent.
¼	10	14	18
5-16	8	12	16
⅜	7	10	13
7-16	6	8	10
½	5	7	9
9-16	4½	6½	8½
⅝	4	6	8
¾	3½	5	6½

20. The weight of one cubic inch of rolled steel is assumed to be 0.2833 pound.

Workmanship.

21. All workmanship must be first class in every respect, and up to the latest practice in modern bridge works.

Lack of facilities will be considered no excuse for furnishing poor or inferior work.

22. All material shall be thoroughly straightened in the shop by proper appliances before being laid off or worked in any way.

23. All shearing of plates and angles shall be neatly done. All gusset plates shall be cut so as to leave no projecting corners. All edges and ends of parts in built members shall bec ut true to line and flush with each other or be dressed after assembling.

24. No sharp unfilleted re-entrant angles will be allowed anywhere, and wherever plate, angle or shape has been cut into, the fillet as well as the cut must be finished with a sharp cutting tool, or with chisel and file, so that no sign of the punched or sheared edge remains.

25. Unless the rivet holes are to be drilled, rivets must never be of less, and will preferably be of greater, diameter than the thickness of the thickest piece they are to connect, except in the case of sole plates or parts not transmitting stress.

26. The size of rivets called for on the plans shall be understood to mean the actual size of the cold rivet before heating.

27. For all unreamed work the diameter of the punch shall be not more than 1-16-inch greater, nor the diameter of the die more than ⅛-inch greater than the diameter of the rivet.

28. All punched holes shall be so accurately spaced that when the parts of any member are assembled, all of the rivets may be easily inserted. Any corrections necessary shall be made with reamers. No drifting to enlarge unfair holes will be allowed.

29. All surfaces that are to be in contact or will be inaccessible after the parts are assembled shall be given a coat of approved paint. (See paragraph 60.)

30. Riveted members shall have all parts well pinned up and drawn together with bolts before riveting is commenced.

31. All stiffeners shall fit neatly between upper and lower flanges of girders. Special care shall be taken to get a tight fit at the upper ends of all stiffeners in deck girders and the lower ends of stiffeners over end bearings in all girders.

32. All fillers under stiffeners and all splice plates shall be cut straight and square at the ends, and not fall back more than ⅛ of an inch from flange angles. All holes or pockets where water might collect must be avoided.

33. All flat lattice bars with single rivets shall have neatly rounded ends concentric with the rivet hole, and their ends must not project beyond the flange to which they are attached.

34. Web plates of girders which have no flange plates shall be flush with the backs of angles or project above the same not more than ⅛-inch, unless otherwise shown in plans. When web plates are spliced, not more than ¼ of an inch clearance between ends of plates will be allowed.

35. All angles or bent plates used as end connections on girders, floor beams or stringers, shall be so accurately fitted that when the member is milled to length, not more than 1-16 of an inch will be taken off these connection angles. (See paragraph 43.)

36. All rivets shall be machine driven where possible, and for rivets with more than one-inch grip a machine capable of exerting a direct pressure upon the rivet, irrespective of the thickness of the pieces being riveted, will be preferred.

37. All rivets must look neat and finished, with heads full, and of equal size, central on shank, and grip the assembled pieces firmly. No recupping or caulking will be allowed. All loose or slovenly looking rivets shall be cut out and replaced. Rivet heads showing an even burr all around the heads will be preferred to a scant head cut down close to the metal under head. In cutting out rivets, great care must be taken not to injure the adjacent metal. If necessary, they must be drilled out.

38. Wherever bolts are used in place of rivets, the holes shall be reamed true to size after the work is assembled, the bolts shall be turned to a driving fit and their threads reduced ⅛ of an inch in diameter under the size of the finished bolts, to prevent destroying the thread in driving. A small washer not less than ⅛ of an inch thick must be used under nut.

39. All finished members built or rolled shall be made straight and free from bends, twists or open joints, and if necessary must be cut apart, straightened and re-riveted. Particular care shall be taken to have all compression members straight before pin holes are bored or ends are milled.

40. In all members, except the top flanges of girders, the abutting joints shall be milled true to a perfect bearing unless they are fully spliced.

41. In tension members and top flanges of girders, the joints shall be cut or dressed true and straight and fitted close together, especially where open to view.

42. All chord and spliced members that are faced for contact bearing shall be put together in the shop, and after being drawn up into contact at the joints and lined up perfectly with the splice plates in place, must have the field rivet holes reamed to a fit before being taken apart. The assembled parts with their splice plates shall be match-marked, so that they may be reassembled in the final erection.

43. All floor beams and track stringers shall be finished absolutely correct as to length, and the outstanding legs of the end connection angles must be in true and parallel planes. Unless special forms are used to hold the end connection angles in correct position during the assembling and riveting, both ends of track stringers and floor beams shall be milled to obtain results desired.

44. All pin holes shall be bored with a sharp tool, leaving a smooth hole. In riveted members holes must not be bored until after the member is all riveted up, and all holes must be bored straight, at right angle to axis of member and parallel to each other.

45. The distance centre to centre of pin holes must be correct within 1-32 of an inch, and the diameter of the hole not more than 1-50 of an inch larger than the size of the pin, for pins up to 5 inches in diameter, and 1-32 of an inch for larger pins.

46. When angles are used for counter, or for lateral or sway bracing, the distance between rivet holes, at opposite ends, shall be made enough shorter than the figured length to insure that the member will be drawn up tight when erected in place.

47. All eye bars shall be straight and true to size; they must be free from twists, folds in the neck or head or any other defects. All heads must be made by upsetting. No welding will be allowed. The manufacturer will be allowed to determine the size and shape of head necessary, within reasonable limits, but he shall guarantee bars to break in the body when tested to rupture, and not in the head or neck. Thickness of the head and neck must not vary more than 1-16 of an inch from thickness of bar.

48. Before boring, each eye bar shall be thoroughly annealed and carefully straightened. Pin holes must be in the centre line of bar and in the centre of heads. The distance from centre to centre of pin holes after boring must be within 1-50 of an inch of the required length. Bars designed to be of the same length shall be bored so accurately in length, that when placed one on top of another, pins 1-32 of an inch smaller than the pin holes can be passed through the holes at both ends of the bars at the same time. The diameter of the hole must not exceed that of the pin by more than 1-50 of an inch for pins up to five inches diameter and 1-32 inch for larger pins.

49. Pins and rollers after being turned perfectly straight and smooth, shall be entirely free from all flaws. Their finished diameters must be that shown on the plans.

50. The screw ends of pins shall be turned down to receive pin nuts. At least one pilot nut and driving head shall be furnished for each size of pin for each span.

51. All screw threads must make tight fits in the nuts. All threads shall be U. S. Standard except at ends of pins.

52. All steel which has been partially heated, shall be thoroughly annealed, except in case of offset stiffeners and fillers, or unless otherwise marked on plans.

53. No welds will be allowed.

54. Roller bed plates shall be planed true and smooth. Cast wall plates shall be planed true to height and with bearing surfaces parallel.

55. All pins, nuts, bolts, rivets and other small details shall be boxed or crated, so that they can be easily handled in unloading, and to insure against loss or damage.

56. The approximate or the scale weight of every piece and box shall be marked on it in plain white figures.

Painting.

57. Before leaving the shop, all steel work shall be thoroughly cleaned from all loose scale, dirt and rust, and be given one good coating of ———————— well worked in all joints and open spaces.

58. On all riveted work, the surfaces coming in contact shall each be painted before being riveted together.

59. Pieces and parts which are not accessible for painting after erection, including tops of stringers, eye bar heads, ends of posts and chords, etc., shall have two coats of paint before leaving the shop.

60. No painting shall be done in wet or freezing weather unless protected under cover. The paint shall be of such quality as may be specified in the contract.

61. Pins, pin holes, screw threads and other finished surfaces shall be coated with white lead and tallow before being shipped from the shop.

Inspection and Testing.

62. The contractor shall furnish all facilities for inspecting and testing the weight and quality of all material and workmanship at the mill or shop where material is manufactured.

63. He shall furnsh a suitable testing machine for testing the specimens and full size eye bars, as well as prepare the pieces for the machine, free of cost.

64. When an inspector is furnished by the railroad company to inspect material at mills or shops, he shall have full access at all times to all parts of mills or shops where material to be inspected by him is being manufactured.

65. He shall stamp each piece inspected with a private mark. Any piece not so marked may be rejected at any time and at any stage of the work.

66. No material shall be rolled nor work done before the railroad company has been notified where the orders have been placed and arrangements have been made for the inspection.

67. The railroad company shall be furnished complete copies of mill orders and plans, and must be notified in time, so that they may have an inspector on hand to inspect material and workmanship.

68. The inspector shall be given reasonable facilities to check the weights of finished members before shipping. Not more than 2½ percent excess weight over figured weight will be paid for by the railroad company.

69. If the inspector, through an oversight or otherwise, has accepted material or work which is defective or contrary to specifications, this material, no matter in what stage of completion, may be rejected by the railroad company.

Additional Requirements when Planing and Reaming are Specified.

70. When planing is required all sheared edges and ends shall be planed off ¼ of an inch, excepting web plates of girders over 36 inches deep, when covered by flange plates, fillers where sheared edges are not seen, and lateral connection plates.

71. All holes for rivets shall be punched at least ¼ inch smaller than the nominal size of the rivet (or 3-16 inch smaller on the die side of the hole), and shall be reamed to a finished diameter of not more than 1-16 inch larger than the diameter of the rivet. (Illustration: For ⅞-inch rivets use a die 11-16 inch in diameter and ream hole to a diameter of 15-16-inch.)

72. Wherever practicable, all reaming shall be done after all pieces fastened together by the same rivets have been assembled. If necessary to take the pieces apart for shipping and handling, the respective pieces reamed together shall be so marked that they may be reassembled in the final setting up. No interchanging of pieces after reaming will be allowed.

73. The burrs on all reamed holes shall be removed by a tool, countersinking about 1-16 of an inch under rivet heads.

74. All field connections in the floor shall be reamed to a fit while the members are assembled in the shop, or to a hardened steel template not less than ½-inch thick.

DETAILS OF AN ENGINE TEST.

A comprehensive engine test has been conducted by Profs. Sidney A. Reeve and C. M. Allen at the power house of the Polytechnic Institute at Worcester, Mass., on a horizontal center crank engine made by the Buffalo Forge Co. of Buffalo. The methods employed in the test are as interesting as the very satisfactory results obtained and the report is therefore appended:

"The engine in question is a single-cylinder, horizontal, center-crank, shaft-governor engine, having a cylinder measuring 12x12 inches and scheduled to run at 300 revolutions per minute. It was erected upon temporary foundations on the power house floor and belted to a quill upon the main line shaft. Steam was drawn from the vertical boilers through 36 feet of permanent covered pipe and 17 feet of temporary naked piping. The exhaust was led through three elbows and 14 feet of pipe into a surface condenser with which all other connections were broken. During the tests the quality of the steam at the throttle was observed many times by means of a throttling calorimeter. The condition of the steam supplied to the engine was frequently investigated. It was at all times practically dry saturated steam.

"In order to ensure absolute steadiness of power developed, the engine's governor was blocked into such positions as would give the various cutoffs desired. The speed was maintained constant by ensuring that the load was at all times greater than that which the engine would drive, the balance being made up by a second engine belted to the same line shaft. The governor of this second engine performed the regulation for the entire system. The speeds recorded are therefore no record of the action of the governor of your engine. The variations between the several tests are due to variety of adjustment of the governor of the second engine and of the load between the two engines. During any one test the speed was sensibly constant.

"During all of the tests all of the exhaust from the engine was condensed in the surface-condenser and the steam-consumption was taken as its weight. During all of the non-condensing tests, care was taken that the pressure within the condenser was just atmospheric, while at the same time no vapor was allowed to escape. During the condensing tests the vacuum maintained in the condenser, about 22 inches, was the best that could be, in view of the limited size of the condenser. This arrangement left the steam pressure as the only variable in any one test, and this was kept as nearly constant as possible by skilled control.

"The duration of each test was twenty minutes, but the engine was always kept in continuous operation for at least one hour, and often for several hours, before entrance upon a test.

"The indicator readings were taken from a pair of Thompson instruments fresh from the hands of the makers. The indicator-rig was built specially for the tests. It contained no geometric error; the error from lost motion was imperceptible; the length of cord involved was 8 inches for one indicator and 24 inches for the other. The indicator-cocks were screwed directly into the cylinder-ports. All gauges and thermometers used were calibrated especially for this work.

"Although not included in our original agreement, the friction of the engine when run empty was carefully determined. Because of the difficulty of making this determination with re-

liability two different indicators and six sets of springs were employed. The result of the whole is that the engine's friction is estimated at very close to 3.0 horsepower or 4.3 percent of the engine's rating. The unusual lightness of this friction led to the repeated checking of its observation, as just noted, before accepting the result.

"The results of the tests are shown in the accompanying table of figures. The only explanation needed is perhaps in regard to the column of 'cylinder efficiency.' These figures show the proportion of the heat available for work, under the conditions actually prevailing at the time of the test, which the engine succeeded in converting into work. That is, it is the percentage of the theoretically possible which the engine actually attained. In this column 100 per cent would be the record, not of an engine which converted all of its heat supply into work, for no engine could imaginably do that, but of an ideally perfect steam engine operating under the conditions under which your engine operated. The results from your engine, figured in this way, are good standard ones.

"In addition to the efficiency tests was run a 36-hour endurance test under 80 pounds of steam pressure and a load of 69.67 horsepower. During its imposition, two observations of

TABLE OF RESULTS OF ENGINE TEST MADE FOR THE BUFFALO FORGE COMPANY, OF BUFFALO, N. Y.

Test No.	Conditions.	Actual Pressure Gauge.	Speed Revolution per Minute.	POWER. Observed	POWER. Average.	Water Rate.	Cylinder Efficiency.	Thermodynamic Efficiency.
*14	Normal Cut-off 125 lbs.	125.50	321.6	125.90	123.5	27.6	55.6%	9.16%
*15		124.00	302.6	121.10		27.5	56.1%	9.17%
3	Normal Cut-off 80 lbs.	79.30	304.1	74.10	71.55	30.6	60.9%	8.30%
4	" "	81.30	308.4	69.35		31.0	59.4%	8.20%
5	" "	78.10	296.1	75.82		31.6	60.4%	8.07%
100	" "	81.60	301.1	69.50		31.7	57.7%	8.04%
101	" "	81.50	299.3	69.00		31.9	57.8%	7.98%
8	25% Under Load 80 lbs.	79.40	297.8	56.00	56.18	33.3	55.9%	7.05%
9		80.30	297.7	56.35		33.0	56.1%	7.11%
6	50% Under Load 80 lbs.	82.00	305.0	37.20	37.09	35.3	52.0%	7.21%
7		81.80	304.3	36.97		35.5	51.8%	7.17%
10	75% Under Load 80 lbs.	81.50	306.1	16.39	16.69	52.3	35.3%	4.87%
11		81.50	306.5	16.99		49.9	36.9%	5.10%
16	25% Over Load 80 lbs.	81.60	304.0	89.30	87.00	33.1	55.3%	7.69%
17		81.10	300.9	87.30		34.4	53.7%	7.41%
18		79.00	298.9	84.40		34.6	54.1%	7.38%
12	Normal Cut-off Condensing	81.90	312.2	88.85	87.64	27.8	66.2%	9.15%
13		80.00	310.3	86.42		27.5	67.4%	9.27%

In the 36-hour test: Pressure, 82.78 lbs. gauge. Horse Power, 69.67 (average). Friction of the engine when run empty: 3.0 Horse Power, equal to 4.3% of rating.

*Tests Nos. 14 and 15 run at 125 lbs. pressure (gauge).

(Signed) SIDNEY A. REEVE, C. M. ALLEN.

efficiency were made. Their results are scheduled with the others as tests No. 100 and 101. As to the showing made by the engine under this endurance test, it can only be said that no fault or suggestion of fault developed itself. The engine ran smoothly and quietly, with cool bearings, throughout the test. When shut down it was apparently ready to start upon a second similar run with equal success.

"As to the general design and construction of the engine, regarding which you inquire for our opinion, we are glad to say that with all which could be seen, upon dismembering the engine both before and after the series of tests was run, we were much and favorably impressed. For simplicity, compactness, good distribution of metal and convenience of arrangement, it provoked favorable comment from all who saw it."

The re-opening of the plant of the Jefferson Iron Co., at Jefferson, Tex., has stimulated interests in iron making in that state. Plans are now being prepared to establish a barge line to operate up the Washita River to the coal fields above Denison, Tex., thence down Red River and up Cypress Bayou to Jefferson. By this means it is said coal can be placed at blast furnaces at as little cost as at any point in the South. An ample supply of iron ore is said to be found in several counties in the vicinity of Jefferson.

NATIONAL ENAMELING & STAMPING CO.

The shares of the National Enameling & Stamping Co. have been admitted to the New York Stock Exchange. The company was incorporated in January, 1899, in New Jersey, with an authorized capital of $30,000,000, of which $10,000,000 is 7 percent cumulative preferred stock and $20,000,000 common stock. Of the amount named $8,396,600 preferred and $15,441,800 common have been listed. The company was organized for the purpose of carrying on the business of mining, smelting, casting, forging, rolling, tinning, galvanizing, enameling and coating of metals, etc. In its listing application the president of the company says:

"The company at its inception took over and owns all the right, title and interest, through the purchase and acquisition of the total capital stock issue of the following corporations: St. Louis Stamping Co., of St. Louis, Mo., and Granite City, Ill.; St. Louis Tin Plate Co., of St. Louis, Mo.; Granite City Rolling Mills, of St. Louis, Mo.; Granite City Sheet & Steel Mills, of Granite City, Ill.; Kieckhefer Bros. & Co., of Milwaukee, Wis., and Chicago, Ill.; Haberman Mfg. Co., of New York, Brooklyn and Berlin, L. I., and all the real estate, machinery and merchandise of the firm of Matthai, Ingram & Co., of Baltimore, Md. There was also issued at the time $2,000,000 of the preferred stock of the company for which the sum of $2,000,000 in cash was realized as a working capital. Since the organization of the company the following plants and businesses have been acquired and absorbed, through the purchase and ownership of the entire capital stock issue of these various corporations: March 1, 1899, American Stamping Co., of New York and Brooklyn, and Eastern Tin Ware Co., of Portland, Conn.; on May 1, 1899, Stewart Enamel Co., of Bellaire, Ohio; on April 1, 1901, Keen & Hagerty Mfg. Co., of Baltimore, Md.; on June 1, 1902, H. Haller Mfg. Co., Limited, of New Orleans. All of these concerns are absolutely free from all bonded debt, mortgage or other obligations of any and every kind whatsoever. Ownership in said organizations has been acquired by the outright purchase of the entire capital stock named, and after the value of the same had been determined by a competent board of appraisers, and payment rendered therefor in some instances by the issue of preferred and common stock, and in other cases by partial issue of preferred and common stock and cash. At the time of the organization of the company, and incidental to subsequent acquisitions, the company took over certain purchase money mortgages amounting to $600,000, and, with a view of extinguishing the same and providing means for the construction and completion of new steel, sheet and tin plate mills referred to above, the company issued, Sept. 1, 1901, $2,500,000 of first mortgage 5 percent gold bonds, consisting of 2,500 bonds of $1,000 each, in 10 serials of $250,000, running from one to 10 years, and redeemable at the rate of $250,000 on the first day of September of each year for a period of 10 years, with interest payable semi-annually on the first days of March and September of each year."

Profit and loss account from July 1, 1901, to June 30, 1902, is as follows:

Remuneration of executive officers, branch managers and directors		$ 106,998.72
Repairs to buildings, machinery, plant, etc.	$ 450,593.78	
Amount written off extraordinary expenditure at sheet mills	7,281.83	
		457,875.61
Interest		15,515.04
Balance down, being net profit for the year		1,988,428.50
		$2,566,817.87
Interest on mortgages (paid off during current year) and bonds		$ 107,593.72
Dividends on preferred stock at the rate of 7 per cent per annum	$587,662.00	
Dividends on common stock at the rate of 4 per cent per annum	463,254.00	
		1,051,016.00
Amount written off organization expenses	$28,500.00	
Amount written off property accounts	132,028.80	
		160,528.80
Balance down, being unappropriated profits or surplus		1,779,707.25
		$3,098,845.77
Gross profits after charging cost of materials, wages, salaries, selling expenses, taxes, insurance and other operating expenses and bad debts		2,566,817.87
		$2,566,817.87
Balance brought down		$1,988,428.50
Balance brought forward at July 1, 1901, as per previous balance sheet		1,110,417.27
		$3,098,845.77
Balance brought down		$1,779,707.25

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of their Wants:—

At Waycross, Ga., the South Atlantic Car & Mfg. Co. is being organized, with a cash capital of $100,000 paid in and the right to increase the amount of capital stock to $500,000. It is announced that the plant will be constructed and put in operation during the coming summer and will have a capacity of manufacturing on an average of ten flat and box cars per day, and also of turning out various kinds of wood work.

The St. Paul Railway Supply Co., St. Paul, Minn., has been incorporated with a capital of $250,000.

The Herron-Brady Pump & Foundry Co., Chattanooga, Tenn., has been incorporated with a capital of $100,000. The company will manufacture steam pumps, hydrants, valves and ornamental iron articles, and will do a general foundry business. About 150 men will be employed.

The Queen City Machine Tool Co., Cincinnati, with a capital of $15,000, has been incorporated by Albert M. Wachter, W. H. Roach, C. J. McDiarmid, O. P. Cobb, Miles T. Watt.

The Bromley Foundry Co., Albion, N. Y., has been incorporated with a capital of $10,000. The company has a contract with the Estes Mfg. Co., of Rochester, N. Y., to furnish that concern a large number of castings.

The Standard Forging Co., Chicago, has been incorporated with a capital of $250,000, to manufacture steel forgings.

The Baltimore & Ohio road has purchased $500,000 worth of machine tools and other shop equipment since Jan. 1 and will need as much more this year. Fully $200,000 has been spent in shop extensions and a large additional outlay will be made. It is probable that the Mt. Clare shop will have its facilities nearly doubled this year, and it is also thought a large repair shop will have to be built at some point west of the Ohio river.

The Stewart Iron Works Co., capital $300,000, has been incorporated at Cincinnati by R. C. Stewart, Jr., W. A. Stewart, H. L. Gordon, W. A. Rinckhaff and Walter L. Granger. Structural iron will be manufactured.

The Wagener Steam Pump Co., Louisville, O., capital $30,000, has been incorporated by W. H. Wagener, Flora Wagener, A. B. Morris, Annie M. Morris and R. B. Cullin.

The Watesly Iron & Metal Co., Cincinnati, capital $10,000, has been incorporated by William Morrison, Mollie Morrison, Dora Morrison, William H. Mathias and Max H. Powder.

The Arthur J. O'Leary & Sons Co., Chicago, with a capital of $25,000, has been incorporated to manufacture machinery and tools.

The Tuerk Mfg. Co., Chicago, with a capital of $25,000, has been incorporated to manufacture electrical machinery and supplies.

The Ripley Rolling Mills, of Lauderdale, Tenn., have been incorporated with a capital of $10,000. Incorporators are: W. R. Miller, Jas. A. Johnston, J. Y. Barbee, N. W. Mays and John A. Johnson.

The Matheson Motor Car Co. has been organized at Grand Rapids, Mich., with a capital of $600,000, of which $200,000 is in preferred stock bearing 7 percent interest and the rest common stock. The board of managers comprises Charles W. Matheson, chairman; George Clapperton, secretary, and Frank F. Matheson, treasurer. The other stockholders are William Kimmerly, John B. Hedges, Dan C. MacKay, Glen J. Barrett and Edwin Owen, as trustee.

The Spargo Wire Works Co., Utica, N. Y., has decided to increase its capital stock from $30,000 to $50,000.

A. M. Chapel Machine Co., Pittsfield, Mass., has been incorporated with a capital of $5,000.

The Hillsdale Wheel Co. has been organized at Hillsdale, Mich., with a capital of $15,000. C. T. Cook, president of the Hillsdale Savings Bank, is president, and George L. Gardener is secretary and manager.

Fires and Accidents:—

The plant of the Olive Stove Co., Rochester, Pa., was destroyed by fire last week. The loss is estimated at $25,000.

The fire in the plant of the Coes Wrench Co., Worcester, Mass., March 3, was confined to the machine and grinding rooms and the loss was about $35,000. The burned building will be replaced by a larger structure.

A boiler explosion in the Toledo plant of the Republic Iron & Steel Co. March 16 caused the death of one man and considerable injury to the plant. Repairs will be begun at once.

New Construction:

The Norton & Cole Machinery Co. will erect a large machine shop at East Norwood, a suburb of Cincinnati.

The contract for erecting the plant of the International Steam Pump Co., at Harrison, N. J., has been awarded. The work comprises machine shop, erecting shop, office, main foundry buildings, pattern shop and other buildings. It is expected that a portion of the plant will be in operation early in the fall.

Pacific Coast Pipe Co., Spokane, Wash., has begun the erection of the plant to replace the one destroyed by fire last fall.

The new machine shop which is being erected by the Crestline Mfg. Co., Crestline, O., will be 100x100 feet, of brick and stone, and will have a 75-h. p. belt com. steam engine, 80-h. p. horizontal boiler, iron stack and a 30-inch pump.

The Cincinnati Electric Motor Co., Cincinnati, O., will erect a plant at a cost of $20,000.

The Hopkins & Allen Arms Co., Norwich, Conn., has voted to add $37,500 to its capitalization, bringing the total amount up to $30,000. About $30,000 worth of new machinery has been installed within a year and another expenditure of $10,000 for machinery is about to be made.

The Republic Iron & Steel Co. will remodel its furnaces 1 and 2 at Birmingham. The two furnaces that are to be remodeled will be worked upon separately so that only one will be out of blast at a time.

The Milwaukee Bridge Co., Milwaukee, Wis., has purchased a site and will erect a building for the manufacture of structural material. The plant will be 145x130 feet.

Ground has been broken for the erection of the new plant of the Smith-Premier Typewriter Co., at Syracuse, N. Y. It is expected that, by working night and day, the construction of the buildings will be finished by July 1 and that the making of typewriters will be begun Sept. 1. The site, which contains 64,500 square feet, will be fully occupied. The main building will be 370x60 feet, with two rear wings 50x40 feet, the whole being six stories and a basement. In addition there will be erected a fireproof building containing the boilers, engines, dynamos, pumps, etc., and a building for the japanning, case hardening, bluing, tempering and other departments of that character. The old and new plants of the company will employ 1,700 people and will have a capacity of 300 machines daily.

The Herzler & Henninger Machine Works, Belleville, Ill., recently incorporated, have a plant, but the building of an addition, so as to have more room for the manufacture of mine cars, is contemplated.

The Baldwin Locomotive Works, Philadelphia, will have an annex where locomotives will be steamed up for testing. It will be only one story high, but will have large ground space.

The Hawkins, Smith & Waggoner Wheel & Car Co. will erect a new plant at Penn Station, Pa., on the main line of the Pennsylvania railroad. The main building, to be used as a machine shop, will be 275x100 feet. The other buildings will be 225x75, 100x40 and 125x50 feet.

The Pennsylvania Railroad Co. is erecting at Cooper's Point, N. J., on the Amboy division, the following buildings: One-story machine shop, 36x120; one-story foundry, 96x70 feet; a two-story pattern shop, and a two-story pattern storage house, 60x32 feet.

The Pullman Co. has purchased a tract of land at Calumet, Ill., and will erect a plant for repairing car wheels.

The machine department of the Baugher, Kurtz & Co., works, York, Pa., is being enlarged by the addition of a building 40x70.

The foundation for the new building for making seamless cylinders at the works of the Harrisburg Pipe Bending Co., Harrisburg, Pa., has been laid, and work has begun on the superstructure. The building will be 40x100 feet.

The Eclipse Gas Stove Co., Rockford, Ill., will add several new buildings to its plant. The largest of the new buildings will be 203x60 feet and two stories high.

The contract has been awarded for the new building of the

Burns Boiler Co., DePere, Wis. The cost will be about $18,000.

The Williams Foundry Machine Co., Akron, Ohio, will build an addition 60x40 feet, four stories, which will double the capacity of the present plant.

The Wisconsin & Michigan Ry. will build new machine shops at Peshtigo, Wis.

The Sioux City Boiler and Sheet Iron Mfg. Co., Sioux City, Ia., has acquired a site and will begin the erection of a building which will be used for the company's works.

The La Crosse Bridge and Steel Co., of La Crosse, Wis., will soon begin building its new plant. The contract for the excavation has already been let.

The Straight Line Engine Co., Syracuse, N. Y., has awarded a contract to the American Bridge Co., for the erection of a new foundry building at a cost of $25,000. The company will also spend $5,000 for new machinery for its shops. The new building will be attached to the present foundry and will be of steel construction 92x160.

The Jenison Iron & Engineering Works, Jenison, Mich., incorporated a few months ago with a capital of $90,000, has completed its plant, and installed its machinery and will begin active operation April 1st with a force of 100 employes. Among the products will be a turbine engine, an electric locomotive headlight and a band saw.

The Wisconsin Foundry & Steel Works, manufacturers of steel ranges, will erect a stock room, 60x60 feet, and build an addition, 60x80 feet, to the foundry. A brass foundry will also be built.

The Dixon Machine Co., Dixon, Ill., recently incorporated, will build an up-to-date corn shredder with automatic feeder attachment and make a specialty of rebuilding traction engines and all classes of heavy machinery, as well as selling heavy machinery of all kinds. The company is located in one of the best heavy machine territories in the country and its facilities are excellent. The concern consists of practical and experienced men in the business.

The Buss Machinery Co., Muskegon, Mich., will build a machine shop, 125x60 feet, and later a foundry.

The Missouri Malleable Iron Co., East St. Louis, Ill., has found it necessary to make a considerable addition to its annealing capacity and also to add one melting furnace, both of which additions are now in process of construction. The demand for malleable castings from its regular customers was so heavy that the company found it impossible to meet them without the additions to the plant.

The American Structural Iron Co., Cincinnati, which was recently incorporated with $250,000 capital, has organized by electing the following officers: President, George R. Scrugham; vice president, F. L. Snodgrass; secretary and treasurer, A. T. Hazen. The above, with George R. Alter and L. P. Hazen, constitute the board of directors. The company has a lot 250 by 266 feet on which it will erect a plant for the manufacture of structural iron.

Pawling & Harnischfeger, crane and hoist builders, Milwaukee, Wis., expect eventually to move from their present location on Clinton, Oregon, Barclay and S. Water Sts. to a new site just purchased on National and 38th Aves. The property acquired is 19⅓ acres, having a north and south frontage of 2,800 feet, and possessing excellent shipping facilities through the belt line of the C., M. & St. P. and the C. & N. W. Roads. Work will begin at once on the new plant, which will be modern and the best appointed that can be devised. The plans of the firm at present are simply to increase their output by the additional buildings to be erected on the new site, though eventually it is the intention to transfer the entire works to this new location.

The Pittsburg District:—

The Pittsburg Steel Co., of Pittsburg, Pa., has purchased an additional tract of land amounting to 15 acres adjoining its present plant at Monessen, Pa., on which it is intended to erect two blast furnaces in the near future.

At the annual meeting of the Union Switch & Signal Co., of Pittsburg, Pa., held last week, President George Westinghouse stated that the management is considering an increase in the capitalization of the company for the purpose of providing funds to pay off the bonded indebtedness and in addition to provide capital for the constantly growing business. Mr. Westinghouse was re-elected president and George G. Smith, James H. Willock, William McConway, Robert Pitcairn and Thomas Rodd were re-elected directors. H. C. Prout was elected to the board of directors to succeed Frank Moore, resigned.

The bi-monthly wage adjustment for puddlers and bar iron workers for the months of March and April made last week shows no change in wages from those prevailing during the first two months of the year. The puddlers will continue to receive $6.12½ per ton, while the heaters and rollers will continue to enjoy the advance made them the first of the year.

At a meeting of the stockholders of the Standard Engineering Co. held at Pittsburg, Pa., last week, it was decided to increase the capital stock from $200,000 to $300,000. The company now has under erection at Ellwood, Pa., a large machine shop and the increased capital is to provide funds for the erection of a large foundry, contracts for which have already been awarded. The officers of the company are Charles E. Wade, president; John M. Shaw, secretary, and C. D. Cobau, treasurer.

The Pittsburg Tube Co., of Pittsburg, has been incorporated with $100,000 capital for the purpose of engaging in the manufacture of butt weld and structural tubing. The machinery and patents of the Illinois Tube Works, of Chicago, Ill., have been purchased and the plant of the Redding Engineering Co. has been leased for a term of years. The work of installing the tube making machinery in this plant has already been commenced and operations will begin shortly. The incorporators of the company are Ralph Overholt, George A. Martin, H. M. Scott, Clyde Overholt and T. C. Graham.

The Clark Coal & Coke Co., of Pittsburg, has applied for a Pennsylvania charter for the purpose of developing coal land amounting to about 2,000 acres and erecting 500 coke ovens. The incorporators are C. B. Clark, W. B. Horner, Frank McCann, John C. Slack, T. W. Welch, Jr., C. E. Willock and L. B. D. Reese.

At a meeting of the directors of the Central Connellsville Coke Co., of Uniontown, Pa., held recently, officers were elected as follows: Herbert DuPuy, Pittsburg, president; John H. Hillman, Pittsburg, vice president, and John C. Neff, Uniontown, Pa., secretary, treasurer and general manager. This company was recently incorporated with $100,000 capital.

The offices of the Westmoreland Steel & Tin Plate Co. will be removed on April 1 from the Second National Bank Building, Pittsburg, to rooms 1413 and 1414 Farmers' National Bank Building, corner of Wood St. and Fifth Ave.

A suit in equity was entered in the United States Circuit Court at Pittsburg last week by John Brislin and William Wesel, administrators of Antonia Vinnac, against the Cambria Iron Co. and the Cambria Steel Co. alleging infringements on patents covering feed tables in rolling mills. In a suit against the Carnegie Steel Co. these patents were recently held valid.

The American Refractories Co., of Pittsburg, has applied for a Pennsylvania charter for a company that will be a consolidation of a majority of the fire and silica brick manufacturing concerns of the country not included in the Harbison-Walker Refractories Co., of the same place. The new company is to be capitalized at $15,000,000. It is also probable that bonds to the amount of $4,000,000 will be issued and the Colonial Trust Co., of Pittsburg, will act in the capacity of trustee. Thirty to forty concerns are to be included in the consolidation. It is probable that the company will be organized early in April as most of the options expire about the middle of that month.

General Industrial Notes:—

The negotiations for the consolidation of the Columbus Elevator & Iron Co., Columbus, O., and the East Iron & Machine Co., Lima, O., have been concluded, the consolidation taking the name of the Lima company. The Columbus plant has been moved to Lima and the plant of the Lima Locomotive Machine Co. has been purchased and will be used in the manufacture of structural and ornamental iron work, jail work, iron fences, etc. The capital is $100,000 and the officers are: President and general manager, W. S. East; vice president, A. L. Neuman; secretary and treasurer, J. L. Simpson.

Through the efforts of the board of trade of Alliance, O.,

a conference was held last week in which President J. E. Schwab of the American Steel Foundries and a committee of the employes of the Alliance plant of the American Steel Casting Co., were present, and a settlement of the difference between the company and the employes was effected. The plant had been shut down for ten days with 800 men idle. By the terms of the settlement the men returned to work at the old scale, and the danger of having the plant removed to another city was averted.

Three large electric cranes are being built by the Brown Hoisting Machinery Co., Cleveland, for the shipbuilding firm of Harland & Wolf, Belfast, Ireland. The contract calls for an expenditure of $350,000.

The machine shop of Redman & Co., Wheeling, W. Va., has been sold to Henry E. Weisgerber and Charles Ebeling, who will continue the business under the name of the Weisgerber & Ebeling Machine Co.

The shops of the Baltimore & Ohio bridge construction department are being moved from Mount Clare to Martinsburg, W. Va., and will be in operation about April 1.

The steel rail mill of the Tennessee Coal, Iron & Railroad Co., at Ensley, Ala., will begin the manufacture of steel rails for the market April 1.

The Southern Car & Foundry Co. has leased, and is now operating, the plant of the Hercules Iron & Supply Co., Anniston, Ala. Castings and other material used for the manufacture of cars, which were formerly made in the departments of the plant recently destroyed by fire, are now being manufactured at the Hercules plant.

The Gilmore Coke Co., of Scottdale, Pa., is erecting 50 coke ovens in Fayette county, Pa. It is probable that the first coke will be manufactured about July 1.

The Ohio Rolling Mill Co., Findlay, O., has been reorganized with the following officers: President, H. Silberman, Cleveland, O.; vice president, L. Bershon, Toledo, O.; secretary, J. W. Edwards, Cleveland O.; treasurer, D. Silberman, Cleveland, O.; general manager, Wm. Brenner, Findlay, O.; directors, H. Silberman, D. Silberman, M. Brenner, Wm. Brenner.

The by-product coking plant of the Sharon Steel Co., at Sharon, Pa., consisting of 212 ovens will shortly be fired. The plant will have an output of about 600 tons daily and the coke will be used in the furnaces at Sharon and in the immediate vicinity operated by the United States Steel Corporation. The gas produced will be used in the various departments of the Sharon Steel Works. F. S. Marquard will be superintendent.

The old stack of the Wheeling Steel & Iron Co., at Martins Ferry, O., is to be entirely rebuilt. It recently collapsed entirely, owing to the sinking of the foundation. Fortunately sufficient warning was given to enable the workmen to draw off all the iron before the stack toppled over.

Blast furnace B, of the National Tube Co., at Benwood, W. Va., was finally blown in last week. This stack will have a daily output of 600 tons. The stack was to have been blown in last fall, but owing to the non-arrival of much of the machinery the date for blowing in the stack had to be postponed from time to time.

The Geneva Coke Co., of Uniontown, Pa., has awarded contracts for the erection of 100 coke ovens at New Geneva, Pa.

On March 9, the blooming mill of the National Steel Co., at Sharon, Pa., rolled 808 tons of material. This breaks the former record of 710 tons. The day turn produced 450 tons, the best previous record being 410 tons.

The Bishop & Babcock Co., of Cleveland, is equipping its machine shop for electric driving. The group system has been adopted and short lengths of line shafting throughout the shops are driven by Westinghouse induction motors. Seven or eight of the latter, ranging in size from 10 h. p. to 40 h. p., have been purchased and are in operation, current being temporarily supplied from the plant of the Cleveland Twist Drill Co. The Bishop & Babcock Co. is installing a power plant of its own and has recently purchased a 175-k. w., two-phase, Westinghouse, engine-type alternator.

The Diamond Drill & Machine Co., Birdsboro, Pa., took off the initial heat at its new steel casting plant on March 7. It is expected that at least one heat a day will be run without interruption. The company's entire foundry was destroyed by fire in June, 1902, and the restoration of plant and the development of full working efficiency has been accomplished in good time.

J. G. Speidel, of Reading, Pa., manufacturer of the Speidel traveling crane, and of the Speidel improved economic hoists, reports unusual activity at his plant. All departments are running at full capacity and orders are promptly filled. A feature of the Speidel hoist is the automatic friction brake, which will hold any load for which the hoist is rated. These hoists are made to lift from half a ton to fifteen tons.

The new blast furnace of the National Tube Co., at Wheeling, W. Va., has been completed for some months and it is expected that it will be placed in operation as soon as the coke situation is relieved. The furnace was built under the designs of Frank C. Roberts & Co., of Philadelphia.

The Ironsides Co., Columbus, O., manufacturer of special lubricants and preservatives, recently held a convention at the Hartman Hotel, Columbus. The several days' sessions, which were given to matters pertaining to the various fields, culminated in a banquet. Most of the sales agents were present and all were greatly benefited by the interchange of ideas.

Spencer Miller, chief engineer of the cableway department of the Lidgerwood Mfg. Co., has been industrious in patenting devices for cableways, logging machinery and hoisting engines. He has already taken out 60 United States patents.

The following is a partial list of engine sales for February, 1903, made by the Allis-Chalmers Co.: The Bucyrus Co., South Milwaukee, Wis., one 16x42 1890 frame Reynolds Corliss engine; Southwestern Missouri Electric Railway Co., Webb City, Mo., one 30 and 60x48 horizontal cross-compound direct-connected Reynolds Corliss engine; Albert Schwill & Co., Chicago, two 26x48 Reynolds Corliss engines; Vulcan Iron Works, San Francisco, one 14x36 Reynolds Corliss engine; Union Electric Light & Power Co., St. Louis, Mo., one 12x16 engine; S. Obermayer Co., Cincinnati, O., one 20x48 Reynolds Corliss engine; George M. Moulton & Co., Chicago, one 24 and 48x48 steeple compound Reynolds Corliss engine; The Javril C., Battle Creek, Mich., one 12x30 girder frame Reynolds Corliss engine; Louisville Railway Co., Louisville, Ky., two 40 and 78x60 vertical cross-compound direct-connected Reynolds Corliss engines; James Davidson, West Bay City, Mich., one 16x42 girder frame Reynolds Corliss engine; Hartwell Brothers, Chicago, one 16x42 1890 frame Reynolds Corliss engine; Chicago File & Rasp Co., one second-hand 14x42 right hand F. & C. Corliss engine; Denver Engineering Works, Denver, Col., two single differential electric driven Riedler pumps.

Adding One Locomotive Daily.

The stockholders of the Pennsylvania Railroad Co., in annual meeting last week, voted to increase the capital stock of the company by $150,000,000, making the total authorized capital $400,000,000. First Vice President Green addressed the stockholders on the resolution authorizing the increase in the capital. He said that for the first time in its history the Pennsylvania Railroad Co. is unable to meet the demands made upon it. Vast improvements have been made and are contemplated in order to furnish facilities for handling the rapidly increasing business. In the past two years, Captain Green said, the company had purchased one locomotive daily and a total of 40,000 freight cars. In Pittsburg alone an expenditure of $10,000,000 will be necessary to relieve the freight congestion and prevent its recurrence. The entire Pittsburg division is to be four-tracked, Captain Green stated, and continuing, said: "We must build a new road from the summit of the mountain down the Juniata Valley and a new road practically from Harrisburg to Philadelphia. Our coal traffic is so enormous that it must be kept out of the way of the passenger traffic. What we propose to do ought to be done promptly."

The Lidgerwood Mfg. Co., New York, manufacturer of hoisting engines, boilers and suspension cableways, has acquired a site at Newark, N. J., and will move its plant from Brooklyn. We are advised that plans for new construction have not been definitely formulated and probably will not be for several months.